The FOUNDRY

Volume 59
Number 10

Published
Semimonthly

CLEVELAND, OHIO, MAY 15, 1931

Castings Aid in Reducing Iron Ores to Metal

METALLIC iron has been used for utilitarian purposes since ancient times. In approximately 4000 B. C. history tells of Tubal Cain, an artificer in iron and bronze. How the metal was reclaimed from its ores at that time

Courtesy Colorado Fuel & Iron Co.
Many Castings Are Used in the Construction of Blast Furnaces

probably is not known but it must have been a tedious process which required much skill. Demand for iron led to the development of the Catalan forge which produced the metal in greater quantities. The blast furnace is the outgrowth of an attempt to utilize the waste heat from a Catalan forge to reduce the fuel consumption of that furnace. In recent years, larger and larger furnaces have been built but until approximately 4 years ago, a furnace of 1000 tons daily capacity was thought to be impossible. At that time the invention of the electrically operated, rotary clay gun for stopping the flow of metal from the furnace solved a major difficulty. Now blast furnaces of 1000 tons daily capacity are common. Of course, the foundry industry aided that development, supplying many castings used in blast furnace construction.

Find Where Castings Can Be Sold

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THE FOUNDRY is published semimonthly by the Penton Publishing Co., Penton building, Cleveland, O. Member, Audit Bureau of Circulations, Associated Business Papers and National Publishers Association.

Branch Offices: Chicago, Peoples Gas building; New York, 220 Broadway; Pittsburgh, Oliver building; Cincinnati, Schmidt building; Washington, National Press building; San Francisco, Alto building; London, Caxton House, Westminster, S.W.1; Birmingham, England, 14 New street; Paris, 9 Rue de Londres; Berlin, Dahlmerstrasse 64A, Berlin Lichterfeld-West. Cable address, Irotrapen, London.

Subscription: United States and Mexico, $3.00 a year; Canada, $4 a year; Great Britain and other Foreign Countries, £1:0:0 a year; single copies 25 cents. Copies published three months or more previous to date of current issue, 50 cents each.

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Convention Gives Impetus To Gaining Industry

COMING at a time when business in general and the foundry industry in particular is emerging from the throes of a major business depression and starting on the steady upward climb to new heights of business prosperity, the thirty-fifth annual convention of the American Foundrymen's association, held in the Stevens hotel, Chicago, from May 4 to 7, has had a stimulating effect. The shattering of attendance records for the restricted type of exhibition, the exceptional interest in the technical sessions, shop courses and committee meetings, the high type of men attending, and the splendid response to the attractive displays of the exhibitors, all have left an indelible imprint upon the foundry industry, giving impetus to the recovery now under way. The attendance was slightly in excess of 3500, a larger total than attended the 1929 convention and exhibition.

Fine Program Was Arranged

The convention was a success in every way. Through the co-operation of the authors of papers, the technical secretary, the papers committee and other standing committees, one of the finest programs ever arranged by the association was presented at Chicago. Sessions covered major problems in the four phases of the foundry industry and each meeting brought forth a large attendance. The shop operation courses, which were inaugurated several years ago and since that time have developed rapidly, were exceptionally well attended, and the experiment of having a shop course at 9 o'clock in the morning indicated a different purpose among those attending A. F. A. conventions compared with the attitude displayed several years ago. The men of the foundry industry go to the A. F. A. convention to secure every possible bit of information which may be valuable to them in the management and operation of their individual establishments and this convention demonstrated that an important session early in the morning, in the evening, at noon, or in fact at any time, will draw a good attendance and, if properly conducted, will develop interesting and valuable discussion.

The exhibition of equipment, larger in floor space and number of exhibits than was the case in 1929 when the show was held in the same hotel at Chicago, is described elsewhere in this issue. Equipment manufacturers interviewed at the close of the week displayed an entirely different state of mind than was prevalent previous to the opening of the exhibition. With the attendance exceeding the most liberal estimate, with those attending showing considerable interest in the various displays, equipment manufacturers pronounced the show a decided success and an important lead to new business for their industry.

President Patch, in the annual presidential address delivered at the opening meeting on Monday afternoon, pointed to a tendency on the part of those in executive charge of different American societies to feel that they must increase in membership to finance projects that they have in mind and to meet the ever increasing cost. To attract new members they broaden their field in the hope of interesting those who are concerned with problems in that broader field. President Patch feels that that is a mistaken policy.

Advise Intensive Cultivation of Field

He pointed out that to attempt to embrace too broad a field will result in spreading too thinly over the field chosen with a consequent inefficiency and lack of accomplishment. To increase the interest of members is a laudable objective which must be accomplished to insure their continued support. However, he believes that rather than embrace new fields to secure increased interest, a more intensive cultivation of a limited field should be undertaken. In this way the association can accomplish a real service to industry as a whole, setting an example to all societies by intensively cultivating the field of the association and doing it with an efficiency that will hold the interest of the members.

The president also paid tribute to the spirit of co-operation that has existed among the board and the executives of the association, and also to the staff of the association for their enthusiastic work during the year. At the opening

Officers of the American Foundrymen's Association, from Left to Right: E. H. Ballard, President-Elect; Robert E. Kennedy, Technical Secretary; N. K. B. Patch, President; C. E. Hoyt, Executive Secretary; and T. S. Hammond, Vice-President-Elect

of the session, the members assembled stood in silent tribute to the memory of Richard Moldenke, Alfred E. Howell and Raymond J. Doty, leaders in the A. F. A., who died during the past year.

The annual exchange paper of the Institute of British Foundrymen, which was written by Vincent C. Faulkner, editor, *Foundry Trade Journal, London*, on the subject "Some Notes on the Structure of the British Foundry Industry" was read by John Shaw, Southsea, England, in the absence of the author. Mr. Faulkner states that as a result of the policy of free imports which has been in operation in Great Britain for about a century, and because of a considerable export business, the foundry industry is more varied than that of other countries. He discusses the technical and scientific organization of the industry, standardization work, and the important phases of the steel, malleable, nonferrous and certain phases of the gray iron foundry industry.

A message of greeting was received from Carlo Vanzetti, managing director and general manager of the Fonderia Milanese di Acciaio Venzetti, chairman of the steel foundry group of the National Fascist Association of the Metallurgical Manufacturers, Milan, inviting the A. F. A. to participate in the International Foundry Exhibition and Congress, to be held in Milan in September. The convention instructed the committee on international relations to send greetings to those in charge of the coming congress.

The annual business meeting of the association was held in the north ballroom Thursday afternoon with President N. K. B. Patch presiding. In a brief report, C. E. Hoyt, executive secretary, expressed his great appreciation for the splendid co-operation which has been given by President Patch during the past year. Mr. Hoyt then presented the report of the judging committee on the apprentice training contest and the reports were accepted. The winners of the contest in the gray iron, steel and patternmaking contests are presented elsewhere in this issue.

Dan. M. Avey, editor, THE FOUNDRY, Cleveland, presented the report of the resolution committee, which consisted of L. C. Wilson, Reading Steel Casting Co., Reading, Pa., J. L. Wick Jr., Falcon Bronze Co., Youngstown, O., and Mr. Avey, chairman. Three resolutions were presented, one expressing appreciation and grati-

tude of the membership at large and the foundry industry; to the authors of papers and members of active committees whose efforts gave success to the convention, on expressing grateful appreciation to the lives and services of Dr. Richard Moldenke, Alfred Howell and Raymond J. Doty, whose loss the industry suffered during the year, and the third, citing confidence in the work of the officers, directors and management of the association. The latter resolution was as follows: "Whereas, the conclusion of the most successful convention and exhibition of the American Foundrymen's association cannot but have a definite and beneficial effect upon the morale of the entire foundry industry and, Whereas, coming at a period when they lacked the temerity to prophesy a successful meeting, the records of attendance and interest attest the judgment and approve the courage of the officers and directors, and,

Whereas, the success of this convention and exhibition constitutes a barometer of the spirit within the foundry industry, that through its many and far reaching manifestations, undoubtedly will exert influence upon business thoughts of many important industrial lines, therefore be it

Resolved, that the membership express its full accord and approval in regard to the policies and accomplishments of the officers and directors during the fiscal year now drawing to a close. Furthermore, the principles and precepts of the American Foundrymen's association, as expressed by the address of President N. K. B. Patch are accepted and approved. To the retiring officers, the board of directors, the executive secretary, the technical secretary and the entire staff, the members of the A. F. A. again express their loyalty and confidence."

The report of the nominating committee which previously was reported in THE FOUNDRY, was read by S. Wells Utley, Detroit Steel Castings Co., Detroit, chairman of that committee. Due to the vacancy in the list of nominees for directors, caused by the death of Raymond J. Doty, the nominating committee met on Monday to nominate a substitute. The following members, nominated by the committee, were declared elected as no further nominations had been received as provided in the by-laws: President, E. H. Ballard, general foundry and pattern shop superintendent, General Electric Co., West Lynn, Mass.; Vice president, T. S. Hammond, president, Whiting Corp., Harvey, Ill.; directors for a three year term, N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo; Fred L. Wolf, head of the development engineering technical and plant control department, Ohio Brass Co., Mansfield, O.; W. B. Moore, president, American Cast Iron Pipe Co., Birmingham; A. G. Storie, vice president, Fittings Ltd., Oshawa, Ont.; and Dan M. Avey, editor, THE FOUNDRY, Cleveland.

The president-elect, Mr. Ballard was escorted to the platform by Mr. Utley and introduced to the membership by President Patch. Mr. Ballard then took charge of the meeting and introduced the other officers present. Upon a motion by past-president Fred Erb, Erb-Joyce Foundry Co., Detroit, Mr. Patch was unanimously elected an honorary member in the American Foundrymen's association.

An interesting feature of the business meeting, a feature which attracted many interested listeners, was a paper on "Centrifugal Casting of Guns" by Col. T. C. Dickson, Watertown Arsenal, Watertown, Mass. As an introduction to his remarks, Colonel Dickson stated that guns are made only of high quality steel, clean and without defects. He first described the construction of the centrifugal casting machine which has been developed expressly for the manufacture of guns. The castings may be made in either a chill mold or a refractory lined mold, but the experience at the arsenal has shown a better structure with the rapid cooling secured through the use of a chill mold. The life of a chilled mold, according to Colonel Dickson, should be as long as the life of an ingot mold. Castings from 200 to 720 pounds have been cast and larger work is to be undertaken. Steel for pouring the guns is melted in high frequency, induction type furnaces. Rate of input of the metal into the mold is proportional to the rate at which the centrifugal pressure decreases as the thickness of the casting increases.

The centrifugal process drives the impurities in the metal toward the bore, and therefore the carbon is higher at the bore than at other points throughout the section. The metal at the bore is under high compression which is not entirely removed by annealing, normalizing and heat treating. The speaker pointed out that because all of this compressive force is not eliminated, the centrifugal casting is stronger than a gun of similar type forged from similar steel. A plain carbon steel of the following analysis was used as a basis for this type of casting; carbon 0.35, manganese 0.61, phosphorus 0.016, sulphur 0.028, and silicon .245. To this is added percentages of molybdenum and vanadium.

The following advantages were given by the speaker for the centrifugal cast gun over the forged gun; segregation of carbon, remarkable ductility, no pipes, greater density of metal, saving of 35 per cent on metal, saving of time, a gun of one

E. H. Ballard Elected President

EGBERT H. BALLARD, recently elected president of the American Foundrymen's association, was born March 3, 1875 in Hartford, Conn. In 1885 his family moved to Lynn, Mass., where his father was connected with the Thomson-Houston Electric Co., one of the companies later merged to form the present General Electric Co. From the age of 13, Mr. Ballard worked in various departments of the plant during school vacations. In 1894 he accepted a position as clerk in the steel foundry department which had just been started. Through W. P. Darling, manager of the steel foundry, he was given opportunity to obtain special training in laboratory and general foundry work in connection with his regular duties. A common school education was supplemented by night school and correspondence course. In 1905, Mr. Ballard resigned to accept a position as superintendent of the Massachusetts Steel Casting Co., Everett, Mass. This company later was absorbed by the General Electric Co. For the past several years he has been general foundry and pattern shop superintendent of the General Electric Co. plants at West Lynn and Everett, Mass. He is a past president of the New England Foundrymen's association and is interested in the industrial education work of the National Founders association. Mr. Ballard has been active in A. F. A. affairs and during the past year served as vice president of the association.

piece and a much more satisfactory product capable of withstanding greater stress.

Attendance at the annual banquet held Wednesday night was unusually large and was a tribute to the speakers who were scheduled and to Ralph Stewart MacPherran, Allis-Chalmers Mfg. Co., Milwaukee, to whom the J. H. Whiting gold medal was presented in recognition of his outstanding accomplishments in the metallurgy of gray iron castings. The medal was presented by Past-President Fred Erb, who, in his address, stressed the value of scientific advance and the far-reaching effects of the contributions to science made by Mr. MacPherran.

President Patch presiding, introduced Hugh Morrow, Sloss-Sheffield Steel & Iron Co., who acted as toastmaster. The principal address was delivered by Dr. Wm. S. Sadler who spoke on some tricks of the subconscious mind, reflecting the doctor's observation upon mental characteristics of the human race.

Instructors Banquet

Interest of foundry instructors of engineering schools in the problems of the foundry industry was displayed at the annual dinner of that group held Tuesday evening. Carl H. Casberg, University of Illinois, Urbana, Ill., acted as toastmaster. The meeting departed somewhat from previous gatherings at which formal speeches have been presented, and the toastmaster called upon each man present for discussion. Frank G. Steinebach, managing editor, THE FOUNDRY, Cleveland, briefly reviewed the history of the joint committee on foundry education in engineering schools and explained the various activities which now are being undertaken by that committee. Robert E. Kennedy, technical secretary of the American Foundrymen's association, Chicago, also talked upon the activities of the joint committee. In pointing to the special work which may be undertaken by the foundry department in any of the state universities, he advocated the establishment of foundry short courses at those universities. He emphasized the work which is being done at the University of Wisconsin and pledged the willingness of the A. F. A. to assist in outlining and arranging a program for such an event.

Prof. J. D. Hoffman, Purdue university, Lafayette, Ind., stated that a lack of co-operation on the part of industry has hampered seriously the development of such short courses. He stated that as a rule universities are more than willing to meet industry half way in preparing such a program but that the initiative for such work must come from industry. Others taking part in the discussion included John Grennan, Unversity of Michigan, Ann Arbor, Mich., P. R. Hall, Pennsylvania State college, State College, Pa., A. E. Wells, Cornell university, Ithaca, N. Y., William H. Dosey, Carnegie Institute of Technology, Pittsburgh, Frederick G. Sefing, Michigan State college, East Lansing, Mich., M. S. Surls, Michigan State College, East Lansing, Mich., O. W. Potter, University of Minnesota, Minneapolis, R. E. Wendt, Purdue university, West Lafayette, Ind., W. F. Wilson and W. H. Parker, American Steel Foundries, East Chicago, Ind., Thomas J. Brown and George H. Scheerer, Lane Technical High School, Chicago, J. Dorrans and R. W. Fowler, Unversity of Wisconsin, Madison, Wis., Arthur V. O'Brien, State University of Iowa, Iowa City, Iowa and J. F. Wooddell, University of Illinois.

About 250 manufacturers of foundry equipment and supplies attended the annual exhibitors dinner held Monday night in the North ballroom of the Stevens hotel. The dinner was held under the auspices of the American Foundrymen's association and the Foundry Equipment Manufacturers' association. After the dinner H. W. Standart, president, Foundry Equipment Manufacturers' association, spoke briefly.

Ladies attending the annual convention of the American Foundrymen's association at Chicago, May 4 to 7, enjoyed the program arranged for their entertainment under the direction of Mrs. T. S. Hammond, general chairman, and Mrs. R. E. Kennedy, general vice-chairman. On Monday, May 4, a reception and tea was held from 4 to 5 p.m. in the lounge of the Stevens hotel by the reception committee composed of Mesdames R. A. Bull, M. J. Evans, F. W. Fuller, L. E. Gilmore, C. E. Hoyt, W. W. Maloney, A. E. McClintock, R. W. McIlvaine, A. S. Nichols, R. D. Phelps, F. B. Fletcher, H. S. Simpson, and A. N. Wallin.

Visit Aquarium

Tuesday, May 5, a trip was made to the Shedd aquarium and the Adler planetarium, and was followed by a motor trip around the Outer drive to view some of the buildings being constructed for the new World's fair, to Jackson park where the old World's fair was held, and the Julius Rosenwald museum is being completed. From Jackson park the tour extended to the Midway and the University of Chicago campus, returning via Michigan boulevard. Mesdames A. E. McClintock, W. W. Maloney, M. J. Evans, and R. D. Phelps acted as hostesses.

On Wednesday, May 6, a luncheon and style show was given in the Wedgewood room, Marshall Field & Co., under the direction of Hostesses C. E. Hoyt, R. A. Bull, R. W. McIlvaine, and H. S. Simpson. On Thursday the ladies divided into small groups and visited the studios of the National Broadcasting Co.

An interesting part of the program of the American Foundrymen's association convention in Chicago was the plant visitations. That section of the activities was in charge of the Chicago Foundrymen's club. The committee, appointed by the club, which had charge of visitation arrangements was composed of Albert N. Wallin, S. Obermayer Co., chairman; George Fisher, Burnside Steel Foundry Co.; H. P. Evans, Continental Roll & Steel Foundry Co.;

The Annual Banquet of The Association Was Held Wednesday Evening in the North Ball Room

J. Hoppe; and M. J. Monihan, International Molding Machine Co. Those plants which were open to visiting foundrymen were: American Steel Foundries, Indiana Harbor, East Chicago, Ind.; Burnside Steel Foundry Co., 1300 East Ninety-second street, Chicago; Chicago Malleable Castings Co., 120th street and South Racine avenue, West Pullman, Ill.; Chicago Steel Foundry Co., 3720 South Kedzie avenue, Chicago; Faunt Bros. Inc., 1551 Fulton street, Chicago; Griffin Wheel Co., 445 North Sacramento boulevard, Chicago; Hansell-Elcock Co., 3153 South California avenue, Chicago; Continental Roll & Steel Foundry Co., Hubbard Steel Foundry division, East Chicago, Ind.; Imperal Brass Mfg. Co., 1200 West Harrison street, Chicago; International Harvester Co., McCormick Works, Blue Island and Western avenue; Chicago, and Tractor Works, 2600 West Thirty-first boulevard, Chicago; Leitelt Bros., 7725 South Chicago avenue, Chicago; Link-Belt Co., 300 West Pershing road, Chicago; Liquid Carbonic Corp., 3100 South Kedzie avenue, Chicago; Sivyer Steel Casting Co., 3100 South Wood street, Chicago; Sloan Valve Co., 4300 West Lake street, Chicago; Western Electric Co., Hawthorne Works, Cicero avenue and Twenty-second street, Chicago; Western Foundry Co., 3634 South Kedzie avenue, Chicago; and the Whiting Corp., Harvey, Ill.

Cost Group Considers Estimating

IN OPENING the cost session Tuesday afternoon, Chairman A. E. Hageboeck spoke of the work of the cost committee since its organization 10 years ago. He stated that in co-operation with the Malleable Iron Research institute and the Gray Iron institute, cost systems have been prepared for the malleable and gray iron branches of the industry. The Steel Founder's Society of America is working on a standard cost method, and the A. F. A. committee is reviewing this report with the idea of making such recommendations as will keep the fundamentals the same for all of the foundry industry. Recently the committee has been considering a definite method for estimating costs. Several subcommittees have been appointed to consider two phases of this work. The report of the subcommittee to formulate data which should be supplied when estimates are requested was presented by Robert E. Belt, Malleable Iron Research institute, chairman. This report states that inquiries from buyers of castings should contain the following information or material: Metal specifications; sample casting or detailed drawing, actual or estimated weight of casting on drawing; number of pieces ordered of each pattern with delivery dates and schedules; description of available pattern equipment and its condition, indicating type of pattern, material from which the pattern is to be constructed, and kind and type of core boxes; is the foundry to make the pattern or will it have an opportunity of suggesting how it should be made; important dimensions, dimension tolerances, machined surfaces and amount of finish to be allowed; special requirements; description of service or use of casting; whether pound price or piece price is desired and f.o.b.; special crating, marking or packing.

The cost committee was instructed to present the report to the National Association of Purchasing agents for its co-operative action. Comments made by several men, who have devoted considerable time to cost work, indicated that the report of the committee is exceptionally complete and covers the ground carefully.

The report of the subcommittee on methods of determining molding costs was presented by W. J. Grede, Liberty Foundry Co., Wauwatosa, Wis., chairman. A questionnaire was sent to a number of foundries in the four branches of the industry, and replies indicate that 66 per cent of those giving the desired information have no system, but depend entirely upon guess. The committee presented two plans, neither of which necessarily is recommended by the committee. The first plan was covered in a paper "The Point System for Determining Molding Piece Rates," by W. J. MacNeill, superintendent, Federal Malleable Co., Milwaukee. This system consists of determining items involved in making molds, assigning relative values to each item and then setting the rates for individual patterns according to the points involved. It was pointed out that this system also is of considerable value when the salesmen is called upon to make an estimate of the selling price of a casting in the customer's office. The second system was covered in a paper "Report on Foundry Price Setting System at the Brown & Sharpe Mfg. Co., Providence, R. I." which was prepared by

T. S. Hammond Made Vice President

COL. T. S. HAMMOND, newly elected vice president of the American Foundrymen's association, was born in Crown Point, N. Y., on Oct. 29, 1883. He received his preliminary education at Hyde Park high school, Chicago, and attended the University of Michigan, Ann Arbor, Mich., from which he was graduated in 1906. Col. Hammond entered the employ of the Whiting Corp., Harvey, Ill., in 1907 and served successively as purchasing agent, assistant secretary, vice president and secretary, vice president and treasurer and finally president and general manager, a position which he now holds. He also is vice president of the National Engineering Co., Chicago; Swenson Evaporator Co., Grindle Fuel Equipment Co., and the Joseph Harrington Co., all of Harvey, Ill. He has been associated continuously with the Whiting Corp. since 1907 with the exception of the time he served in the army on the border in 1916 and with the American expeditionary forces in France. Col. Hammond is president, Electric Overhead Crane institute, vice president, Illinois Manufacturers' association, and serves on the executive board, Chicago association of commerce. He is a past president, Foundry Equipment Manufacturers' association, National Founders association and Chicago branch, National Metal Trades association. He also has taken an active interest in the work of the A. F. A., having served on various committees and one term as director.

Leroy M. Sherwin, foundry and pattern shop superintendent of that company. This system was built up from a large number of time studies taken in that foundry. It is made up of constants and variables. The constants are prepared in the form of a curve sheet or set of figures which takes care of all operations common to all jobs

J. H. Vogel, York Ice Machinery Co., York, Pa., Studied the Melting of Gray Iron and Malleable Iron in the Indirect Arc Furnace

made on certain squeezer machines, molding machines bench or floor.

T. H. Harrison, Stevenson, Harrison & Jordan, Cleveland, presented a paper entitled "Scientific Rate Setting in Foundries." He pointed out the importance of scientific rate setting as a means of reducing and controlling direct labor cost, as a basis for standard cost finding and exact estimating. Mr. Harrison advocated a method which calls for the establishment of the time of various fundamental operations and then the determination of those which go to make up elements of any particular job.

J. L. Wick, Jr., Falcon Bronze Co., Youngstown, O., who presided at the nonferrous foundry cost session, emphasized the paramount importance of costs under present competitive conditions. Cost, as defined by Mr. Wick, is the sum of all expenditures in production, with nothing added and nothing taken away. Accordingly, correct costs are as important to buyer as to seller and are a decided deterrent to the policy of price cutting.

Price cutting usually is resorted to in a spirit of panic and is the common practice of manufacturers who have no knowledge of costs and who do not appreciate the effect upon the entire price structure. According to Mr. Wick, no excuse can be given for the brass foundry which in these days is ignorant of costs. The suggested standard system produced by the American Foundrymen's association and available through the *Transactions* for January, 1931, gives a basis for estimating nonferrous costs.

The principal speaker of the session, E. A. Baker, Ellery A. Baker & Co., New York, stated that there is no need to fear the competitor who knows his costs. It would be beneficial to those who operate upon known costs to pay the expenses of installing adequate cost systems in the foundries of those competitors who are ignorant of their cost structure. The three elements of cost, material, direct labor and expense, were briefly analyzed by Mr. Baker. He noted that merchandising expense at present is larger than ever before. The fallacy of average costs, with the attendant evil of loading the foundry which operates on average costs with the more intricate and expensive work, was shown clearly.

Variations in melting cost are a difficult problem of the nonferrous industry. For example, in one foundry 100 pounds of metal melted will show 20 pounds of good castings, while in another the same melt will yield 70 pounds. Obviously, the application of the average melting cost is of doubtful value.

In the discussion which followed, C. S. Humphrey, Westco-Chippewa Pump Co. Davenport, Iowa, spoke of the difficulties of interesting a group of foundries in a comparison of costs. The benefit of this comparison upon the entire cost structure of a unit is obvious. Chairman Wick said that uniformity in costs and a comparison among a group of foundries will remove elements of ignorance, will lead competitors to tend to quote similar prices and will reduce differences in prices to differences in operating practices rather than in cost methods. Under mergers which bring control to a large central company operating

W. H. Spencer, American Cast Iron Pipe Co., Birmingham, Ala., Co-author of a paper on the Effect of Soaking Charges in the Cupola

foundries in various units, some educational work in costs obviously is necessary. Often a member of a large firm will quote prices far below costs, and powerless to do otherwise through the fact that small elements in these larger merger groups seldom have a voice in either cost or prices.

W. F. Graham, Caskey Brass & Bronze Co., Philadelphia, emphasized the need of giving the man in direct charge of department operation a voice in determining costs. The effect is psychological as well as physical in reducing costs. E. H. Ballard, General Electric Co., West Lynn, Mass., stressed this point further and stated that as manager, he insists on every man in charge of each departmental operation having a thorough knowledge of the individual cost on every item. Every job is estimated by all men who will have any part in the operation, whether molding, core making, or cleaning. These estimates are recorded and compared with the actual cost in following the work.

Malleable Iron Committees Report

MALLEABLE cast iron foundrymen had a busy day Tuesday with two sessions scheduled. The first was held at 10 o'clock under the chairmanship of F. M. Robbins, Ross-Meehan Foundries, Chattanooga, Tenn., with E. E. Griest, Chicago Railway Equipment Co., Chicago, as vice chairman. The meeting was opened with the presentation of a paper on thermal balances of malleable melting furnaces by J. H. Hruska, Berwyn, Ill. Mr. Hruska included typical data from air, electric, and open-hearth furnaces, cupola, and cupola-electric furnaces to show the method of calculating heat balances. That paper was followed by the report of the joint committee on refractories which was presented by J. R. Allan, International Harvester Co., Chicago, representative of the A.F.A. on the committee. The report recommended new tolerances for fireclay refractories for malleable furnaces as follow: Standard length, ± 1/16-inch; standard width, ± 1/16-inch, and standard thickness, —3/64-inch.

Following the presentation of the report on refractories, various committee reports were made by the chairmen which included those on program and papers by E. E. Griest; symposium on the physical properties of malleable cast iron for the American Society for Testing Materials, by Enrique Touceda, Malleable Iron Research institute, Albany, N. Y.; round table meetings, by R. E. Bryant, Jefferson Union Co., Lockport, N. Y.; symposium on malleable cast iron for the American Society of Mechanical Enginers, by C. S. Anderson, Belle City Malleable Iron Co., Racine, Wis.; shop operation courses, by A. M. Fulton, Northern Malleable Iron Co., St. Paul, Minn.; malleable cast iron handbook, by Prof. Scott Mackay, University of Wisconsin, Madison, Wis., and the report of the committee on specifications of which H. A. Schwartz is chairman was read by F. M. Robbins.

The round table luncheon which im-

mediately followed the first session was attended by approximately 80 foundrymen. R. E. Bryant acted as chairman and a variety of questions were discussed. One was on the causes of surface checks which periodically appear on test bars. Opinion indicated that the checks were cold shuts, and several instances were cited in which the difficulty was overcome by tilting the mold about 1 or 1½ inches from the horizontal, and pouring at the lower end. Information was asked on the causes of checks in castings which previously had been made satisfactorily. It was suggested that the checks might be due to variations in rates of expansion and contraction of different irons, and in the different sections of the casting. For example, it was mentioned that where a thin section adjoined a heavier one, the thin section may be expanding while the heavy one is contracting which gives rise to stresses.

Another suggestion presented was that the checks might be caused by maintaining too high a dry bond strength in the sand. The sand would not give freely, and would cause a check. By decreasing dry bond strength the trouble would be eliminated. No set rule can be given to determine to what extent the dry bond strength should be decreased, and it was recommended that a cut and try method be applied until the checking was stopped.

In discussing the effect of high pouring temperature on shrinkage the general opinion seemed to be that it caused increased shrinkage and promoted cracking. However, one man pointed out that his foundry obtains metals at the spout ranging from 2890 to 2920 degrees Fahr. as determined by an optical pyrometer, and less shrinkage was observed in the metal. A duplex process employing a cupola and an electric furnace with metal containing between 2.60 and 2.80 per cent carbon was being used.

Inquiry was made on methods of reducing or eliminating scaling in muffle type annealing furnaces, and whether packing the castings would be of any value. One man stated that when his muffle furnace was being operated at about half its capacity that scaling had been encountered. Different coals and cokes were tried, and the best results were obtained with a finely ground petroleum coke. A question was asked whether it was feasible to apply a magnetic test to determine if small malleable castings are properly annealed. It was stated that experiments had shown that unless the length of the casting was considerably greater than its diameter, magnetic tests were useless.

Attention Given Steel Problems

NEED for a new classification of steels was presented by Maj. R. A. Bull, Electric Steel Founders Research group, Chicago, in a paper presented at the Wednesday morning session on steel, presided over by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J. The paper was entitled "Chemical Composition as Employed for Classifying Carbon and Alloy Steels for Castings." In addition to the discussion from the floor, a written discussion was submitted by A. W. Gregg, Bonney-Floyd Co., Columbus, O. Supporting Major Bull's claim, Mr. Gregg suggested that the classification should show definitely the amount of each alloy present and also the physical properties. This would prove of value both to maker and consumer.

J. H. Hruska, Berwyn, Ill., Presented Data on Thermal Balances of Melting Furnaces and Production Costs in Malleable Foundries

The chairman pointed out that the proposed measure would take a long period of time to accomplish. Several technical bodies now are working on the subject and nomenclature and specifications cannot be adopted until present development work is finished. On motion, the meeting went on record in favor of requesting the A.F.A. to appoint a special committee to attend to the subject.

F. A. Melmoth, Detroit Steel Casting Co., Detroit, presented in abstract his extensive paper "Some Metallurgical Points in Acid Openhearth and Electric Steel for Castings." He deplored the present day mania for speed of all kind. Some foundrymen seem to think it is more important and more to their credit to knock a heat out of an electric furnace in 1¼ hours than it is to make good steel. Proper time is required for furnace operation and quality of product should not be sacrificed for speed records.

In this contention he was supported by George Batty, Steel Castings Development bureau, Philadelphia, and by the chairman who quoted several instances from an experience covering a period of many years. The time factor is important, but the time in the furnace must not be prolonged. Too long a period in the furnace is just as deleterious to the steel, as a period that is too short.

A number of slides were used to illustrate the paper presented by C. W. Briggs and R. A. Gezelius, Naval Research laboratory, Anacostia, D. C. on "Detecting Casting Defects by Radiography Using Gamma Rays." It is claimed that a penetration of 10 inches is possible by this method as opposed to the former possible penetration of 3½ inches.

The meeting was prolonged over the luncheon period and carried on as a round table discussion until 3.30 p.m. under the chairmanship of H. P. Evans, Hubbard Steel Foundry division, Continental Roll & Steel Foundry Co., East Chicago, Ind.

Discussion covered acid electric steel melting process with special relation to gas content in the steel and pin hole troubles; clay for dry sand facing mixtures; backing sand; effect of clean steel on casting defects; core sand mixtures for cores which would be surrounded by heavy metal sections.

N. A. Moore, Piston Ring Co., Muskegon, Mich., Pointed Out that Excessive Moisture in the Cupola Blast May Cause Hard Castings in Thin Sections Such as Piston Rings

Wide differences of opinion were expressed in the discussion which followed the presentation of a paper entitled "Interrelationship of Pin Hole Trouble and the Low Ductility Problem," by George Batty, Steel Castings Development bureau, Philadelphia, at the Thursday session on steel plant practice under the chairmanship of Maj. R. A. Bull, Electric Steel Founders Research group, Chicago.

The author stated that the paper was prepared in part as a rebuttal of certain claims advanced in a paper, "Deoxidation and Mold Conditions on Tensile Properties of Carbon Steel Castings," by J. V. McCrae and R. L. Dowdell published in the Proceedings of the American Society for Steel Treating, 1930. Mr.

Batty claimed that embrittlement and consequent low ductility is promoted by alumina consequent on the addition of aluminum to the steel and that the cure of the pin hole trouble and the solution of the low ductility problem are to be achieved by the provision of a green sand molding medium of proper constitution and composition. He also directed attention to the fact, sometimes overlooked, that the backing sand should be more permeable than the facing sand.

After congratulating the author on the excellence of the paper, John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J. detailed part of his experience over a period of 25 years in an attempt to trace relationship between the use of aluminum as a deoxidizing agent, the presence of pin holes and the ductility of the metal.

H. J. Cole, General Electric Co., Schenectady, N. Y., in a paper entitled "A Comparison of Synthetic and Natural Bonded Molding Sands for Steel Foundries," detailed an extended experience both in the shop and the laboratory and the conditions which finally led to the return to the use of natural bonded sand.

Commenting on this paper the chairman pointed out that no sweeping conclusions should be drawn, because it merely represented a local experience and the conditions did not parallel those in other localities where many foundrymen consistently have been using synthetic sands.

This point was further elaborated in a paper "Steel Foundry Molding Sands and Facings," presented by A. S. Nichols, Illinois Clay Products Co., Chicago. The paper was based on answers from fifty steel foundries in the central states.

Outline Nonferrous Methods

NONFERROUS founding received close attention Tuesday morning. John W. Bolton, Lunkenheimer Co., Cincinnati, was chairman and was assisted by D. H. Wray, Henry Wray & Sons Inc., Rochester, N. Y. Mr. Bolton opened the session with the report of the committee on recommended practices

Henri Marius, Lenoir Car Works, Lenoir City, Tenn., Described the Use of Permanent Molds in Producing Bronze Bearings

for nonferrous founding which contained data on field of use, chemical control, sand, cores, gating and heading, etc., for the 85-5-5-5, 80-10-10, and manganese bronze alloys. The report was followed by a paper by T. Mauland, International Harvester Co., Chicago, on cupola melting of brass. Inquiry developed the fact that ratios of 15 to 1 were obtained. Robert Lusk, Mueller Co., Decatur, Ill., stated that with the 85-5-5-5 alloy he obtained a 17 to 1 ratio. Silicon carbide bonded with a proprietary cement is used for lining with a life of 15 tons per lining with patching as needed. Mr. Lusk in reply to a question from R. L. Binney, Binney Castings Co., Toledo, O., on the value of the cupola in reclaming brass skimmings said that it works satisfactorily on concentrates with plenty of lime for a flux. Another member suggested that iron oxide be added to give a fluid slag with high lime content.

Selection of alloys, design of patterns, methods of molding, etc. for bronze pressure castings was the subject of a paper by J. E. Crown, U. S. naval gun factory, Washington. Several discussed the paper including W. B. Ball Jr., Edna Brass Mfg. Co., Cincinnati; T. H. Addie, American Manganese Bronze Co., Philadelphia; Mr. Rae, Wright field, Dayton, O., and N. K. B. Patch, Lumen Bearing Co., Buffalo. Mr. Ball inquired as to the size of the shower gates used by Mr. Crown who stated that they were ⅜ x 1-inch. Shrinkage or contraction was taken care of by making the casting 8 inches longer than required.

The shower-gate method as applied to the castings was advocated as the metal is cooling at the bottom, and hot on top, and the agitation caused carries the dirt in the mold to the header. Mr. Addie stated that he used chills to obtain better grain structure, reduce shrinkage troubles, and a better skin for machining allowance. A question by Mr. Wray developed the fact that the castings were poured at approximately 1950 degrees Fahr.

R. W. Parsons, Ohio Brass Co., Mansfield, O., discussed deep etching of brass as applied to gating problems. Etching was accomplished by obtaining a smooth surface on the specimen and subjecting it to the action of nitric acid for 7 to 8 minutes, and revealed any defects in the specimen. W. F. Graham, Caskey Brass & Bronze Works, Philadelphia; Dan Broggi, Neptune Meter Co., Long Island City, N. Y.; H. M. St. John, Detroit Lubricator Co., Detroit, and T. H. Addie, American Manganese Bronze Co., Philadelphia, discussed the paper. Mr. Graham suggested that the design of the test bar be changed to obtain better results. Mr. St. John said he believed the lowest possible temperature of pouring should be used that will give the soundest casting. The condition usually gave the best grain size, and physical properties also. Mr. Addie inquired if anyone had noticed that with cast-on coupons that the lower section of the bar sometimes showed a coarse grain structure. E. J. Ash, bureau of standards, Washington, stated that he believed the test bar as used by the author of the paper was not fed properly as the gate had frozen too soon and the riser at the opposite end contained cold metal.

Considerable interest was displayed at the roundtable luncheon conference on nonferrous foundry problems which was held Wednesday under the

R. W. Parsons, Ohio Brass Co., Mansfield, O., Solved Brass Gating Problems Through the Application of Deep Etching

direction of H. F. Seifert, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., chairman, and F. L. Wolf, Ohio Brass Co., Mansfield, O. Approximately 125 men were present and the discussion covered a wide field. A question was asked on the cause of pinholes in an aluminum manifold from ¼ to ⅜-inch thick, which had to withstand pressure. It was suggested that the casting be gated generously and the metal melted at the proper temperature. Pinholing was caused by dissolved gases which come out upon solidification. It appears that hydrogen is the trouble maker and it may be derived from fuel or water vapor.

In aluminum castings where a slight porosity exists, seepage may be overcome by forcing linseed oil under pressure into the casting. The ercess oil is dumped out and the casting baked at a temperature sufficient to carbonize the oil. The effect of different maximum melting temperatures on structure of castings in red brass may not be due so much to temperature alone as it is to contamination according to one speaker. How-

ever, in pouring, care must be taken to see that the proper temperature is used for the type of casting involved. If the temperature is too high porosity ensues, and if the temperature is too low, red oxides and pipes usually are present.

L. B. Knight, National Engineering Co., Chicago, described the Use of Synthetic Sands for Molding Purposes

Inquiry on the melting and casting of monel metal and nickel alloy castings developed the fact that holes are caused by improper gating. To obtain the requisite melting temperature and speed, it was suggested that the blast be preheated. In charging, some charcoal is placed in the bottom of the pot or electric furnace, and gates, etc., charged first to form a bath, and then the heavier material is charged. Use about 1½ to 2 per cent silicon with the charge, and pour out a small test piece similar to that used in testing the pitch of copper, and observe it similarly. When the pitch is correct, good results will be obtained in casting. Monel and high nickel alloy castings should be gated similarly to aluminum bronze, or steel foundry practice. If the furnace atmosphere is high in sulphur, a cover slag of half silica sand and half lime may be used. The best pouring temperature is around 2850 degrees Fahr. with light castings around 2950, and heavy castings at about 2750 degrees Fahr. Carbon content should be around 0.20 per cent. High carbon around 0.25 to 0.30 per cent causes graphitization, and low carbon under 0.10 per cent allows oxides to be present.

In a discussion of the effect of sulphur on brasses and bronzes, it was stated that much depends upon the form of the sulphur. It never exists in the free state but is present as sulphide of copper, zinc, etc. One speaker said that in the 80-10-10 alloy and high lead alloys, the sulphur usually is present as cuprous sulphide, and does not give any trouble. However, in a 4 per cent zinc alloy, the sulphur is present as zinc sulphide, and when the sulphur is above 0.08 per cent, it is detrimental.

It was pointed out that high pitch copper is better for high lead alloys than low pitch copper as such copper appears to aid in holding the lead in dispersion. Another interesting fact brought out was that phosphorus will reduce zinc oxide, and it is used for that purpose in small amounts in rolling mill brasses in Europe. One member inquired on difficulties likely to be encountered in using chromium plated scrap, and he was assured that little difficulty will result as chromium readily is removed by melting the scrap at a high temperature in an oxidizing atmosphere.

Papers on molding practice for aluminum alloy castings, application of the x-ray as a tool for improving aluminum alloy foundry practice, permanent molds for brass and bronze, and the effects of nickel in bronzes were discussed at the nonferrous session held Thursday morning with Sam Tour, Lucius Pitkin Inc., New York, as chairman, and H. M. St. John, Detroit Lubricator Co., Detroit, as vice chairman. L. H. Fawcett, U. S. Naval gun factory, Washington, who prepared the paper on molding practice for the 4 to 5 per cent copper-aluminum alloy was unable to be present and a short abstract of the paper was presented by E. J. Crown also of the gun factory.

F. W. Graham, Caskey's Brass & Bronze Works, Philadelphia, inquired on the removal of risers from the castings and it was stated that they were removed with a band saw. Mr. Field, British Aluminum Co. Ltd., New York, asked for information on the core sand, molding sand, facing, and the mold condition. Mr. Crown said that several types of core sands were used. One using lake sand with an oil ratio of 150 to 1 was used on an extremely delicate job, and had to be handled carefully as it was fragile. Heavy cores were composed of one-third sharp silica sand bonded with 30 per cent clay, a sand which is used in steel foundries, and two-thirds Albany sand or crushed cores. Proprietary core oils formed the bond which was in the ratio of 1 to 50.

Molds were made in green sand, and due to the large number of chills in the molds, and the time duration between molding and pouring, the finished molds were sprayed with crude oil, skin dried, and poured while still warm. The sand used was No. 0 Albany, and no facing material was used.

Following the discussion H. J. Rowe, co-author with E. M. Gingerich, Aluminum Co. of America, Cleveland, of a paper entitled, "X-ray as a Production Tool to Improve the quality of Aluminum Alloy Castings." gave a brief synopsis of the work.

In the absence of Henri Marius, Lenoir Car Works, Lenoir City, Tenn., a short abstract of his paper "Permanent Mold Foundry Practice for Bronze Castings," was given by R. W. Parsons, Ohio Brass Co., Mansfield, O. F. W. Graham, Caskeys Brass & Bronze Works, Philadelphia,

W. M. Saunders, Providence, R. I., Prepared Data on the Effect of Heat on the Permeability of Facing and Core Sands

in discussing the paper stated that he had found that metal molds did not give a satisfactory structure in bronze castings which had to withstand pressure. The thin sections had a tendency to form columnar crystallization rather than the equiaxe system which is more desirable.

The session closed with a short review of a paper on the effect of nickel on six general, sand-cast, brass and bronze alloys by N. B. Pilling and T. E. Kihlgren, both of the International Nickel Co., Bayonne, N. J.

Pattern Problems

PROBLEMS pertaining to patternmaking attracted considerable interest at the roundtable session on that subject Tuesday morning. Approximately 65 attended the meeting at which Vaughn Reid, City Pattern Works, Detroit, was chairman and Russell Scott, Packard Motor Car Co., Detroit, vice chairman. The first part of the discussion was devoted to pattern color standards. It was agreed that these colors, when properly applied to patterns, assist the molders greatly and at the same time tend to reduce the scrap loss. Resistance to the use of the colors often comes from the customer, due to a certain extent to the slight additional cost that may be required when the standards are followed. To secure the advantages of the color markings, the purchasing agent should state on the order that all patterns must be finished according to A. F. A. color standards.

Trouble sometimes encountered in the use of shellac was discussed. It was stated that some of the difficulty may be attributed to inferior alcohol, but that in summer, when the humidity is high, moisture will be absorbed by the shellac, which will result in sticky patterns. It also was stated that experiments have been conducted with a liquid coating for metal patterns which hardens and thus prevents the absorption of moisture.

In reply to a question regarding the proper shoulder to leave on a vertical taper, it was stated that the

standards prepared by the A. F. A. cover the subject, calling from 1/16 to ⅛ shoulder. Sometimes the shoulder may be made too straight with not sufficient draft to draw the pattern. To overcome this, one of the group stated that he uses a fillet. It also was stated that standards for core tapers also have been prepared by the A. F. A.

Discussing the question "Are Premium Systems in Pattern Shops a Real Incentive To Lower Costs?" it was found that one member present was using a premium system. He pointed out that the system was developed to reduce costs, not by labor but through a reduction in overhead. The system is set for the average workman, but it has resulted in a speeding up of the work of some of the slower men. Where the job is being done by a group working at different rates of pay, the premium is divided among the various members in proportion to the wage.

The meeting closed with a rather heated discussion on the subject of co-operation. It was agreed that the greatest co-operation should exist between the designer of the casting, the patternmaker and the foundryman. The designer should be familiar with the metallurgical and physical problems encountered in the manufacture of castings. The patternmaker should visit the foundry and the molder should visit the patternshop to become better acquainted with the many problems facing each.

A paper by Walter C. Ewalt, Walworth Co., Kewanee, Ill., entitled "Horizontal Core Prints" was presented to the members and recommended for further study.

Cite Gray Iron Developments

IN THE absence of the author, Major Pierre Nicalou, Paris, France, the exchange paper of the French Foundry Technical association, "Testing Cast Iron," was presented by R. F. Harrington, Hunt-Spiller Mfg. Co., Boston at the Tuesday session on gray iron presided over by J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. The author of the paper does not favor the torsion test for cast iron. The compression test has certain value, but more reliable conclusions may be drawn from the hardness or ball test. In addition to the knowledge to be gained from micrographs, the author favors three methods of testing: Static bending test, shear test and hardness test.

J. C. Bennett, York Ice Machinery Co., York, Pa., Discussed Melting of Gray Iron and Malleable Iron in the Indirect Arc Furnace

John Shaw, Southsea, England, presented the British viewpoint in favoring methods different from the testing methods in use either in France or America. He claimed the shear test does not give a true indication of strength of the casting. The ordinary test bar is not quite satisfactory in that it rarely corresponds with the actual thickness of metal in the casting. He pointed out that samples of metal taken from the outer part and the inner part of a casting vary widely in strength.

In a written discussion, R. S. McPherran, Allis Chalmers Co., Milwaukee presented conclusions derived from a number of tests made in collaboration with the late H. E. Diller. John W. Bolton, Lunkenheimer Co., Cincinnati described methods of and conclusions drawn from the double shear test.

"Manufacture and Use of Cupola High Test Iron," by L. M. Sherwin and T. F. Kiley, Brown & Sharpe Mfg. Co., Providence, R. I., were described by Mr. Kiley. The paper precipitated a lively discussion from many angles including the item of patent rights. The subject was discussed by David McLain, Milwaukee, Henry Lane. Detroit, H. Bornstein, Deere & Co., Moline, Ill., M. L. Gregory, Caterpillar Tractor Co., Peoria, Ill., Dr. F. Meier, Rockford, Ill., G. Olson, Illinois Malleable Iron Co., Chicago and M. Aiken, Anthes Foundry Co., Winnipeg, Canada, John Shaw questioned the temperature of 1600 degrees Cent., not only mentioned by the author of the paper but by other American foundrymen he had encountered. He claimed that temperature never was attained in any British foundry.

Other papers presented included "Effect of Soaking Time on Initial Temperature and Analysis of Cupola Melted Iron," by W. H. Spencer and M. M. Walding, American Cast Iron Pipe Co., Birmingham, Ala., and "A New Type of Inclusion in Cast Iron and Its Relation To Manganese, and Silicon Content," by F. J. Cook, Birmingham, England.

Melting methods in gray iron with respect to the indirect arc furnace, electric process iron for special castings, hot blast cupola work, and cupola control through atmospheric regulation were considered at the Wednesday morning session, with J. D. Stoddard, Detroit Testing Laboratory, Detroit, chairman.

J. C. Bennett and J. H. Vogel, metallurgist and assistant superintendent, York Ice Machinery Corp., York, Pa., presented a paper on the melting of malleable and special gray iron castings in the indirect arc 1-ton, rocking type furnace. Informal discussion was given by M. J. Gregory; R. J. McSherry, Studebaker Corp., South Bend, Ind.; G. Olson, Illinois Malleable Iron Co., Chicago; Henry M. Lane, Detroit, and several others. Discussion centered in the actual competitive commercial advantages of the electric furnace and cupola methods for various type castings, quality and scrap control. The existing low average price of borings in determining relative costs was mentioned.

Mr. Vogel emphasized flexibility in making various mixtures as a marked advantage of the electric furnace, showing that his company during a day's run had poured ordinary gray iron for small pressure castings, low carbon gray iron with 2 per cent nickel for manifolds, high phosphorus iron for piston rings, and malleable iron for large connecting rods. A summary of the costs showed power, $7.93 per ton of iron poured; refractories, $2.55; electrodes, $1.82; labor, $1.40; and interest, depreciation and repairs, $2, making a total of $15.70, with refractories offering the best opportunity for further reduction in costs. The normal gray iron charge was shown to be 60 per cent borings and 40 per cent of the company's own scrap.

Production of iron cylinders and cylinder head castings in a 3-ton-per-hour electric furnace in an effort to obtain a consistently better grade of iron was described by H. E. Bromer, metallurgist, Standard Foundry Co., Racine, Wis. Mr. Bromer pointed out that during periods of slack demand, melting from cold stock in the electric furnace proved economical.

Mrs. G. D. Conant, Cornell University, Ithaca, N. Y., Collaborated with Dr. Ries in Preparing a Paper on the Shape of Sand Grains

He emphasized close control of chemical analysis and physical properties through the electric furnace method, particularly with respect to strengths and hardness. He pointed out that

D. Woolley, Singer Mfg. Co., Elizabethport, N. J., Conducted an Investigation of the Factors Which Influence the Surface Quality of Iron Castings

strengths ranged from 40,000 pounds per square inch tensile for plain irons to 60,000 pounds for special alloy irons. A brief written discussion on impact testing by J. G. Pearce, director of the British Cast Iron Research association, Birmingham, England, showed the advances made in the last year in test methods. Other discussion on cold metal and duplexing costs, temperatures and quality of iron was participated in by B. G. Parker, Youngstown Foundry & Machine Co., Youngstown, O., L. W. Starner, Frank Foundries Corp., Moline, Ill.; and M. J. Gregory. Mr. Bromer added that much of the work is poured at about 2800 Fahr.

The Moore hot blast cupola was described by James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., as developed by suspension of vertical pipes inside the cupola through the abrasion zone, which proved satisfactory. Mr. MacKenzie presented operating records showing variations in temperature and amounts of coke consumed in comparison with the cold blast process. Experiments on the best material for the pipe resulted in castings of approximately the same composition as ingot molds with an average life of 75 heats of 20 hours each. Discussion included informal talks by R. S. MacPherran and M. Sklovsky, Deere & Co., Moline, Ill. Failures from growth of the metal in melting were brought up, and problems of gas analysis in the control of the cupola were mentioned.

Regulation of atmospheric moisture and the effect of excessive oxygen on the chilling of cast iron when pouring into light castings was the subject of the paper by N. A. Moore, metallurgist, Piston Ring Co., Muskegon, Mich. He described the installation of a refrigerator system for the control of moisture in the blast resulting from seasonal conditions. Effect of excessive moisture in the cupola blast, and its relation to the oxygen content of the iron was developed. A. L. Boegehold, General Motors Corp., Detroit, emphasized the importance of considering the relation of excessive moisture to chill, especially when light castings are poured. R. M. Allen, Bloomfield, N. J., asserted that the mass of evidence is such that effect of atmospheric moisture must be given further study. He declared that the fluidity evidence so far is not conclusive. The paper was discussed by R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston; H. H. Watson, Pittsburgh Electric Furnace Corp., Pittsburgh; H. R. Clarke, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.; Stanley Binns, Cincinnati Milling Machine Co., Cincinnati; and H. M. Lane.

The exchange paper of the Belgian Foundry Technical association on phosphorus in cast iron, by J. Dessent and M. M. Kagan, Liege, Belgium, and presented by J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. featured the closing gray iron session. The paper was greeted as an important contribution to the study of phosphorus in general gray iron practice.

Discuss Effect of Phosphorus

It was declared that the preponderance of evidence seems to show that phosphorus does strengthen the metal's resistance to heat and thus delays the growth, and that it increases the resistance of the metal to acid attack to an important extent. The resistance to the transverse bend is not marked, and hardness increases slowly, but lineally with the phosphorus content. Mr. MacKenzie pointed out that the authors arrived at the conclusion that the phosphide as it commonly occurs in gray iron is the ternary eutectic rather than the binary eutectic, as has been generally apparent. It was stated also that a low percentage of phosphorus with low silicon assists in the formation of graphite to a decidedly feeble extent, but that higher percentages are practically without effect. A valuable summary of opinions was presented on the effect of phosphorus on the properties of combined and total carbon.

H. R. Clarke, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., found that phosphorus reduces the transverse bend when carbon content is well controlled. The effect of phosphorus on the physical properties still is untested. Phosphorus in relation to wear resistance was mentioned in a brief discussion by Stanley Binns, Cincinnati Milling Machine Co., Cincinnati, and the effect of phosphorus on machining was discussed by R. S. McPherran.

A spiral feed method of testing the fluidity of metals was outlined by C. M. Sager, U. S. bureau of standards, who emphasized that the pouring temperature with respect to the fluidity is of importance. He described the test as applied to cast iron, aluminum and 85--5-5-5 alloy.

A paper on the effect of molding sand composition with respect to the surface quality of gray iron castings, prepared by W. G. Reichert and D. Woolley, metallurgical engineers, Singer Mfg. Co., Elizabethport, N. J., was read by Mr. Reichert. He concluded that the grain size and moisture content of the molding sand are the main factors which influence the surface quality of a casting. He pointed out that in selecting a sand for casting where the surface is important, these two factors must be considered in connection with the physical qualities required by the particular mold. The paper showed results of a series of investigations to determine the influence of varying sand conditions on the face of a casting. With a special pattern of two flat round disks, sands of American Foundrymen's association grain classes and clay content classes were tried under varying conditions of grain fineness, moisture content, mold hardness, seasonal conditions, increase in clay content, method of

Roy M. Allen, Bloomfield, N. J., Gave a Detailed Discussion of the Use of the Microscope as a Practical Aid in the Cast Iron Foundry

ramming, pouring temperature and fluidity of the metal. Variables were changed and the resulting surface appearance of the casting appraised and checked.

Advantages of pressing the molds from the top in providing for better escape of the gases, as well as porosity of the sand were discussed by R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston; A. Silbert, Foote Bros. Gear & Machine Co., Chicago, and several others.

A treatise on the microscopic examination of metals for the practical study in the gray iron foundry, and for the younger metallurgist was submitted by R. M. Allen, consulting metallurgist, Bloomfield, N. J. A. L. Boegehold, General Motors Corp., Detroit, and J. W. Bolton, Lunkenheimer Co., Cincinnati, warned against incorrect conclusions based on lack of experience in training in metallography. The latter suggested that microscopic study may be applied with better results as a research tool in the hands of those well trained in such procedure. He also raised issue concerning some of Mr. Allen's considerations of formations of ferrite, cementite, pearlite and graphite in the various grades of iron, and the effects of the variations in the nature

of pearlite, and the various forms of carbon.

Mr. Allen described his paper as a practical handbook for general service. An appendix contained general instructions on the microscope, preparation of specimens and the use of etchants in photomicrographic examination of metallurgical specimens. He also illustrated various chill structures, and the effects of silicon, sulphur, phosphorus and manganese.

Nonferrous Course Features Gating

REAL value of the shop operation courses to the practical man was evidenced by the number and character of attendants at the first of three nonferrous shop operation courses, held Tuesday at 4 p.m. under chairmanship of E. R. Darby, Federal Mogul Corp., Detroit. E. J. Ash, U. S. bureau of standards, Washington, outlined the work which has been done upon shrinkage of pure metals. Three distinct shrinkage points are encountered; namely in the liquid state, at freezing and in the solid condition. Foundrymen probably are not troubled by liquid contraction, which usually is found to be constant in rate and amount, but the solidification shrinkage due to the different stresses encountered in selective crystallization, may vary. It was found that with one pure metal cooling from 1200 to 840 degrees Fahr, the decrease in volume was 5.7 per cent, which would require an additional feeding of 2.8 per cent on a 50 pound casting.

C. M. Saeger Jr., also of the bureau explained the methods and equipment devised to measure and compare fluidity, consisting primarily of a spiral of definite width and depth, and 60 inches long, with an approved type of horn gate and spill

S. M. Brah, Tri-City Manufacturers' association, Moline, Ill., Spoke on Related Instruction for Foundry Apprentices

basin or overflow. Tests which are now in progress have given some interesting facts, tending to show that in pure metals, dry sand molds give a longer spiral than green sand and that, apparently, the higher melting temperatures exert no influence upon fluidity, providing the pouring temperature is constant. Questions from those in attendance drew from Mr. Saeger the opinion that close comparative results may be obtained, but that no study has been made of variation in moisture in green sand molds, nor of permanent molds.

J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham stated that a comparison of the fluidity testing methods on cast iron show good correlation. H. M. St. John, Detroit Lubricator Co., Detroit, expressed the opinion that small quantities of impurities will affect fluidity. For example sulphur in brass will make it sluggish, while phosphorus will increase fluidity. Temperatures will exert little influence, unless the properties of the metal are affected in attaining high temperatures, due to effects of the atmosphere, linings, etc. M. E. Brooks, Dow Chemical Co., Midland, Mich. stated that magnesium alloys show a fluidity test check of ½-inch in the 60-inch spiral.

Gating practice as related to aluminum bronze, manganese bronze, high-zinc yellow brass, and other high shrinkage alloys produced some interesting discussion at the nonferrous shop operation course held on Wednesday. P. E. McKinney, Bethlehem Steel Co., Bethlehem, Pa., chairman, opened the session by presenting an outline of the various factors to be considered, and then called upon T. H. Addie, American Manganese Bronze Co., Philadelphia, for some remarks.

Manganese Bronze Cited

Mr. Addie stated that one of the principal things to be observed in gating manganese bronze is to admit the molten metal to the lowest point of the casting, with the least agitation. To do that the sprues in large castings are broken several times from the opening where the metal is poured in, to the point where it enters the casting. Wherever possible the casting is made so that the foundry foreman can observe the metal as it rises in the casting. In that way, he can see any small particles of dirt or dross and remove them with a rod before they can attach themselves to the wall of the casting and cause defects.

In small castings a skim gate is used, and in some instances the same effect is obtained by cutting part of the runner in the drag and part in the cope. An overlap between the two portions gives the skim-gate effect. In manganese bronze it is necessary to use ample risers or heads, and he cited a large valve for a water project which had 4 and 6-foot openings and 22,000 pounds of metal in the head alone. The head was in the form of a ring and was an extension of the upper flange. The lower part of the side flanges were cast against a chill to promote uniform cooling, and the side flanges were joined to the top flanges to aid pouring and feeding.

G. H. Clamer, Ajax Metal Co., Philadelphia, stated that in the high shrinkage alloys, aluminum or magnesium are used as deoxidizers, and those materials form insoluble materials which are sometimes difficult to remove and increase the shrinkage of the alloys. He advocated gating methods as outlined previously and use of chills and risers to take care of the shrinkage or contraction. E. J. Ash, bureau of standards, Washington, mentioned that the liquid or volume contraction of the 85-5-5-5 alloy was 4 per cent, and aluminum about 6.6 per cent.

M. M. Walding, American Cast Iron Pipe Co., Birmingham, Ala., Co-author of a Paper on the Effect of Soaking Charges in the Cupola

Sands used for manganese bronze are similar to those used for yellow brass as the temperatures involved are not much higher. A variety of metals may be used for the chills in either aluminum or manganese bronze as not much difficulty is encountered in obtaining good results, if the chills are prepared properly. E. R. Darby inquired about the use of strainer gates, and it was stated that if used properly, they may be employed where basins cannot be used. They should be placed close to the pouring end rather than to the mold cavity.

R. L. Binney, Binney Castings Co., Toledo, O., in referring to aluminum bronze containing 20 per cent nickel, said that the metal should not be agitated any more than necessary, and for that reason whenever possible the metal is poured from the same pot that it is melted in. He also stated that better results are obtained when pockets are formed at the ends of the sprues when changing the direction to avoid

a high fall of metal, and many times the sprue is arranged so that the metal drops down and comes back up to enter the casting in the cope side.

Choke gates are used to keep the metal clean, and enable the sprue to be kept filled. Care must be taken to insure a smooth skin on the mold faces so that no small projections are present to catch any films that may be floating in the metal. Mr. Binney said that he obtained better results by using chills of the same material as the casting, and that the gates and risers are removed from the casting with an abrasive wheel 1/16 x 16 inches.

The final shop operation course on nonferrous founding was devoted to gating practice for aluminum alloys and red brass. H. M. St. John, acted as chairman of the meeting. He announced that the short paper on gating red brass prepared by William Marr, Ohio Brass Co., Mansfield, O., would be read by R. W. Parsons of the same firm. A number of specimen gates of castings were shown to indicate the value of proper gating to obtain a better yield, make molding easier, and to obtain better castings.

In one instance a gate of eight castings molded on their sides was changed to 12 castings on a gate molded in the drag. The change increased the yield from 49 per cent to 69 per cent, and lowered the core costs considerably. Mr. Marr advocates a runner of oval section with the greatest diameter at right angles to the gates to the castings. He also suggests that a choke be placed close to the runner, and that the gate or feeder between the choke and the mold cavity be enlarged to act as a dirt catcher, and feeder.

Other gates of castings shown included one containing four small globe valves, and one containing a single valve. The runner on the gate of four valves was cut into the top and bottom of each flange nearest the runner. In the case of the single valve, a single sprue was cut into a semicircular runner leading to the flanges on either side. Shrink bobs or blind risers were placed near the entrances to the two flanges.

T. F. Kiley, Brown & Sharpe Mfg. Co., Providence, R. I., with L. M. Sherwin Produced Cupola High Test and Alloy Irons and Described Their Uses

J. W. Collins, Aluminum Co. of America, Cleveland, outlined the various factors that relate to gating and feeding aluminum alloys. He divided the subject into four main topics which included importance of proper gates and risers, planning ahead for the best location of gates and risers, cost of melting excess metal and its removal from castings, and types of gates and risers. In discussing typical gates for aluminum alloy castings, Mr. Collins stated that the storage gate is quite common. That gate consists of two sprues a short distance apart joined with a runner of comparatively large cross section. From the sprue nearest the casting, the runner section is reduced in size, and it is dropped slightly from the level of the first runner. The effect gained from the difference in size of the runners and the difference in levels is that of a skim gate, the dirt and dross collecting in the sprue nearest the casting.

Horn gates also are used to a large extent as the metal may be fed into the bottom of the castings. By bottom feeding, cooler metal is delivered to the heavier sections such as bosses which usually are in the top, and that aids in overcoming shrinkage troubles. Horn gates also, according to Mr. Collins, lend themselves well to attachment at points ordinarily difficult of access. One example cited was the use of a horn gate for feeding heavy sections below a large core print. The horn gate due to its shape was attached to the mold cavity without disturbing the core print. Strainer gates sometimes are used, and the holes in such a gate should have an area about 20 per cent greater than that of the sprue in which the strainer is placed.

W. F. Graham, Caskeys Brass & Bronze Works, Philadelphia, in discussing gating problems mentioned that in medium and heavy castings, gating may be from two considerations. These are slow and fast entrance of the metal to the mold cavity. The horn gate for example feeding into the bottom of a casting containing flanges at the top, would allow the metal to enter slowly, while sprues attached to the flanges at the top would permit a rapid filling of the cavity. Mr. Marr said that in using strainer cores in the sprues in malleable iron castings, it had been discovered that if the sprue was to one side so that the metal did not fall directly on the strainer core, better results were obtained.

Study Malleable Molding Problems

THE first of the two shop courses which were arranged for the first time on malleable cast iron opened Tuesday afternoon with H. W. Highriter, Malleable Iron Research institute, Cleveland, as leader, and A. M. Fulton, Northern Malleable Iron Co., St. Paul, Minn., as assistant leader. The subject under consideration was melting practice, and, as outlined by Mr. Highriter, was divided into six divisions or factors. Discussion on each of the factors had been assigned previously, and the first on raw materials and specifications for the materials was presented by W. L. Ranis, Union Malleable Iron Co., Moline, Ill. Mr. Ranis described the specifications for pig iron, malleable scrap, and gray iron scrap as adopted by the A. F. A.

He was followed by Mr. Fulton who gave some information on the method of calculating charges for the furnace. According to J. B. Deischer, Columbia Malleable Castings Corp., Columbia, Pa., whose paper was read by Mr. Fulton, disposal of the charges in the furnace is important. The regions of greatest heat are one-third the distance from the stack end of the furnace, and one-third the distance from the firing end. The central region between the two points mentioned obtains less heat. Consequently, the charges should be disposed in such a manner as to obtain the most rapid and even melting.

Due to the variety of furnaces used for melting, the subject of practice with them was divided into the several types. J. H. Lansing, Danville Malleable Iron Co., Danville, Ill., described practice with a powdered coal fired air furnace. Mr. Fulton covered hand-fired air furnaces while August Van Lantschoot, Iowa Malleable Iron Co., Fairfield, Ia., described air furnace melting with oil fuel. W. H. Spencer, Belle City Malleable Iron Co., Racine, Wis., gave some information on use of the electric furnace for melting. Duplexing with the cupola and electric furnace was described by C. F. Joseph, Saginaw Malleable Iron Co., Saginaw, Mich. E. F. Wilson, Jefferson Union Co., Lockport, N. Y., outlined the information available on the use of the rotary type powdered coal-fired furnace, and the meeting was closed with a short paper on testing of heats, and the correction of abnormal heats by Mr. Highriter.

The Wednesday afternoon shop operation course on malleable was devoted to a discussion of molding practice under the leadership of E. F.

Wilson, Jefferson Union Co., Lockport, N. Y. A paper on "Duties of Molding Foreman" by William M. Marr, superintendent of foundries, Ohio Brass Co., Mansfield, O., was presented by R. W. Parsons, metallurgist of that company. This paper pointed out that the attributes of leadership are skill in the trade, honesty, ability to understand the problems of others, sound judgment, and confidence. It is the duty of the foreman to see that proper and adequate instruction is given to new men and to see that the compensation for work is fair. Safety also is a responsibility and the methods and materials used must come under his direction.

A paper by J. O. Klein, general superintendent, Decatur Malleable Iron Co., Decatur, Ill., on "Foundry Equipment" was read by A. M. Fulton, superintendent, Northern Malleable Iron Co., St. Paul, Minn. The author stressed the necessity for frequent inspection of all of the equipment which is used in the molding department, including flasks and patterns. The necessity for fitting the right man in the right job was emphasized in a paper on "Personnel Factors" by L. B. Stanton, foundry superintendent, Jefferson Union Co., Lockport, N. Y. and read by H. W. Highriter, Malleable Iron Research institute, Cleveland.

An exceedingly interesting paper on "Patterns" was presented by W. J. MacNeill, superintendent Federal Malleable Co., Milwaukee. Mr. MacNeill discussed the importance of proper material and workmanship for patterns and core boxes. He also discussed the mounting of patterns, selection of flask size, cores, chilled and loose pieces, elimination of shrinks and design. He stated that he had found it a good rule to use loose pieces when a core in the cope can be eliminated, and to eliminate loose pieces when a core can be placed in the drag.

A final paper dealing with "Estimation of Molding Production," was presented by Evan F. Wilson, assistant superintendent and metallurgical engineer, Jefferson Union Co., Lockport, N. Y. He pointed out that two methods may be used in estimating the molding production, namely statistical and synthetic. He also discussed foundry planning.

Sand Shop Course Holds Interest

IMPORTANCE of sand to foundrymen amply was demonstrated by the attendance at the first of the shop courses on that subject held Monday afternoon. About 125 were present at the meeting, with W. G. Reichert, Singer Mfg. Co., Elizabethport, N. J., leader, and C. M. Saeger Jr., bureau of standards, Washington, assistant leader. Mr. Reichert described methods used for determining moisture, and mentioned the effect of moisture on permeability, green and dry sand strengths, surface of castings etc.

H. W. Dietert, United States Radiator Corp., Detroit, stated that care must be taken in adding water to sand to obtain uniform distribution and suggested that the nozzle of the hose be pushed under the surface of the sand. Mr. Saeger described a rapid method for determining moisture. A 50 gram sample of sand is placed in a dish and covered with 50 grams of alcohol, which is ignited. After the sample is cooled, it is reweighed, and the moisture content determined by the difference in weight. Results obtained are accurate to within 0.5 per cent. A. A. Grubb, Columbus, O., outlined a method which was applied to reduce molding losses resulting from excessive moisture. Molders were held responsible for the proper moisture content which was checked by the laboratory from heap samples. Molders also were instructed in judging the sands, and in a short time were able to maintain the moisture within the desired range.

Some discussion arose over the value of adding cereal or other organic binders to reduce the quantity of water when added. George Batty, Steel Castings Development bureau, Philadelphia, stated that cereal binders with bentonite are added to green sands for molding light steel castings to obtain the desired bond strength with the least possible quantity of water. He also stated that to obtain the best results, it was desirable to begin with a sand which had been dried at 220 degrees Fahr. or slightly above, add the cereal and bentonite, and add a definite amount of water. He also pointed out the fallacy of making a quality facing sand possessing desired permeability, and surrounding it with a carelessly compounded backing sand lacking in permeability. Such a condition nullified the effects of the facing material.

Dr. H. Ries, Cornell University, Ithaca, N. Y., Who Investigated the Shape of Sand Grains

The second shop operation course on foundry sand was held Tuesday morning with A. A. Grubb, Grubb & Marshall, Columbus, O., as leader and W. L. Ranis, Union Malleable Iron Co., Moline, Ill., as assistant leader. Mr. Ranis gave a short paper on "Effect of Fineness and Permeability on Castings." He stated that fineness, moisture and clay affect permeability. Increasing air pressure on squeeze type molding machine or increasing the number of jolts decreases permeability. Additions of 6 to 10 per cent seacoal may reduce permeability as much as 50 per cent.

Surface blows, core blows, misruns, and cold shuts often may be attributed to low permeability, and an undue amount of fine material, which reduces permeability and may allow the molten metal to cut. W. G. Reichert, Singer Mfg. Co., Elizabethport, N. J., said that he used the fineness test to determine the addition of fine core sand due to the molding process. He also mentioned that size and distribution of sand grains affect the surface condition, and that for small castings seacoal was not used, but it was used on large castings. One member stated that a fine, naturally bonded sand had caused difficulties in his plant so they adopted a synthetic sand composed of lake sand and a bond which had uniform grains. The sand used for malleable castings had a permeability of 55 to 60.

Gottfrid Olson, Illinois Malleable Iron Co., Chicago, mentioned an experience in which difficulty of rattails and scabs was overcome by passing the sand through a core knockout device which included an air suction. The machine removed the loose fines from the sand and eliminated the trouble. R. F. Harrington, Hunt-Spiller Mfg. Corp., South Boston, Mass., stated that he is using bentonite as a binder in synthetic sand in his plant and that it is unnecessary to remove the fines from the sand. George Batty, Steel Castings Development bureau, Philadelphia, stated that grain shape is important, and that steel castings manufacturers have had to go to synthetic sands made from silica sand, cereal binder and bentonite. He also suggested that fine sands may have a greater chilling effect on molten metal, and that that may be the reason why the low permeability of such sands does not have a noticeable effect.

Bond strength and control of

foundry sand were discussed at the Wednesday shop operation course presided over by L. B. Knight, National Engineering Co., Chicago. A. A. Grubb, Columbus, O. advocated low bond strength for several reasons including the element of hardness in the face of the mold. Sand with low bond may be rammed harder than sand in which the bond is high and the resulting casting will be true to weight and size.

Commenting on this point in connection with a question raised in relation to the use of a vent wire, H. W. Dietert, United States Radiator Corp., Detroit, stated that conditions have changed to a radical extent in recent years. When all ramming was done by hand, the tendency was to use a high bonded sand, which held its shape under comparatively light ramming. The permeability of this type of sand is comparatively low and venting with a wire was necessary in nearly all cases. With the advent of the power operated ramming machine, this condition no longer obtains. A more permeable sand is employed which may be rammed much harder.

In extreme instances artificial vent passages still are required and these are formed with a vent wire. In this connection a member explained an ingenious device for preventing the vent wire from striking the pattern while at the same time insuring a maximum penetration. By inserting the wire slowly he touches the pattern. Then he withdraws the wire from ¼ to ½-inch and marks it and later solders a washer at that point.

Frequent riddling of the sand in the heaps was advocated for the double purpose of removing foreign material and increasing the strength and toughness without impairing the permeability.

The closing shop operation course on sand was devoted to losses caused by sand, and was under the direction of H. W. Dietert, U. S. Radiator Corp., Detroit, and P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill. Mr. Dietert presented an illustrated talk on the various types of losses that may be attributed to sand, and how they are caused. Such losses include blows, scabs, washes, rat tails, buckles, etc., and many of those may be caused by low permeability of the molding sand used, and to excess moisture. Low permeability sometimes is due to fine grain size, but more often is encountered in sands that are fat or have a high bond. With high bond the sand grains become coated with clay which reduces the permeability rapidly even though the grains are such as to apparently give an open sand. Another difficulty with high bond is that such sands require more moisture to obtain a given effect. Consequently, the effect is twofold.

Difficulties often can be eliminated by reducing the bond in the sand by addition of unbonded material of the proper grain size which opens up the sand and reduces the amount of water necessary. In speaking about cores, it was mentioned that if cores of high permeability were used, defects often occurred because the metal did not rest on the core.

Points Way in Apprentice Work

MEN constitute the most important factor in the foundry industry. With this statement, C. J. Freund, Falk Corp., Milwaukee, and chairman of the committee on foundry apprentices, gave a brief discussion of the need for apprenticeship training in the foundry industry to train men to supervise and operate the complex mechanisms in industry today. Due to the preliminary publicity given the session by the committee, the meeting, which was held Wednesday afternoon, developed considerable interest.

A paper "Related Class Room Training for Foundry Apprentices" was presented by S. M. Brah, apprentice supervisor, Tri-City Manufacturers association, Moline, Ill. This paper represents the results of survey made by the author to determine the related instruction being given foundry apprentices in plant and municipally conducted training courses. The report gives the amount of time spent on instruction in related subjects, the type of courses covered, costs of conducting courses and other factors of importance.

In the discussion which followed this paper, W. F. Simon, Industrial Commission of Wisconsin, Madison, Wis., stated that the initiative must come from the foundrymen. Best results should be obtained by organizing local and state groups of those interested. He spoke of the value of class room instruction in connection with any foundry apprentice course. F. K. Ferguson, apprentice supervisor, East Chicago Public schools, East Chicago, Ind., stated that it is necessary to have a definite schedule for the class work so that the foreman may know just when the apprentice will be out of the shop.

H. S. Falk, Falk Corp., Milwaukee, explained that in his plant the company has the system of having several older apprentices to act as pinch hitters for the machines operated by apprentices. These men usually are in the last year, and not only do they fill in for the absent apprentices, but also for absent mechanics. This system works to the advantage of the company and the boy, for while all of the machines are kept busy, the boy is permitted a varied experience.

Mr. Falk also presented a paper entitled "Getting a Program of Community Apprenticeship Under Way." In this he stresses the importance of local groups developing programs of community apprentice training. Attention and hard work, with some one person made responsible for the enterprises, are essentials for success in such a movement. That Mr. Falk has set up a model of procedure which should prove exceedingly valuable to communities anticipating such a program, was the opinion expressed in the discussion.

Apprentice Awards

IN THE annual apprenticeship contests sponsored by the American Foundrymen's association, the work of the following young men was adjudged in the order of merit: In gray iron molding first place was given the casting made by Thomas Smedley, Red Jacket Mfg. Co., Davenport, Ia., second place to Victor Sanders, John Deere Harvester Works, East Moline, Ill., third place to Rollo Van Camp, French & Hecht, Davenport, Ia.

In the steel molding division first place was awarded William Norton, Hubbard Steel Foundry, East Chicago, Ind., second place to Ralph Adams, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Louis Chick, Hubbard Steel Foundry, East Chicago, Ind., was named third.

First place in the patternmaking contest was awarded Herbert Larson, John Deere Harvester Works, East Moline, Ill. The second prize was awarded to B. J. Kafczynski, Geo. H. Smith Steel Casting Co., Milwaukee and third place to Edward G. Janda, Milwaukee Pattern & Mfg. Co., Milwaukee.

Because of the extensive character of the technical sessions and shop courses at the Chicago convention, it has been impossible to present all of the complete reports in this issue. Reports of the gray iron shop course, steel shop course and the sand session will be presented in the June 1 issue.

The Editors

General View of the Ball Room Where Foundry Supplies Were Shown

Shows Progress in Equipment

BY EXCEEDING in every way the previous restricted exhibit held in 1929, the exhibition of foundry equipment and supplies, held in conjunction with the annual convention and exhibition of the American Foundrymen's association in Chicago, May 4 to 7, exceeded early expectations regarding size and attendance. More than 45,000 square feet of floor space was utilized in excess of that required to house the 1929 exhibit, which also was held in the Stevens hotel. One hundred and sixty-seven different firms and organizations maintained displays in the large exhibition hall or the grand ballroom, showing practically every item of equipment and supplies employed in nonferrous, gray iron, steel and malleable foundries.

While the number of new machines displayed was not as large as has been the case in recent years, several entirely new developments were shown for the first time. In addition a wide variety of equipment was exhibited in which improvements and refinements recently have been made. A detailed account of many of the interesting points of the show follows:

IMPORTANCE of sand handling in modern foundries was demonstrated amply by the variety of apparatus featured by manufacturers specializing in such equipment.

A new sand handling unit was exhibited for the first time by Royer Foundry & Machine Co., Wilkes-Barre, Pa. The unit is T-shaped; the cross member constituting a shakeout device, and the main member a tempering belt. The castings are shaken out through the vibration of the cross member, which also causes the castings and scrap to move along the shakeout grid to one end. The sand falls through the grids to a tempering belt which carries the sand to a sand separator and blender for reuse. Standard Sand & Machine Co., Chicago, exhibited a sand mixer which rotates in a horizontal plane and is equipped with a screen. An operating model of a roll mixer for continuous sand handling systems also was shown. National Engineering Co., Chicago, displayed one of its large sand mixing machines equipped with sand aerating device at the discharge gate. A small laboratory type mixer was included and photographs of sand handling, sand preparing, and molding equipment also were shown.

Two sand throwing machines for mixing and blending molding sands were featured by Universal Sand Equipment Co., Cleveland. Clearfield Machine Co., Clearfield, Pa., displayed a laboratory size sand mixing machine. Three types of electrically driven gyratory riddles and a gyratory shaking device for determining the fineness of sands featured the display of Great Western Mfg. Co., Leavenworth, Kans. Niagara Concrete Mixer Co., Buffalo, showed its screen for conditioning foundry sands. A double deck and a smaller single deck vibrating screen for reclaiming and reconditioning sands were exhibited by Productive Equipment Corp., Chicago. An electrically operated vibratory foundry riddle, a smaller one for determining the fineness of foundry sands, and flexible shaft driven hammers for chipping, etc. were shown by Foundry Supplies Mfg. Co., Chicago. Carol Engineering Inc., Dayton, O., showed a view of its sand conditioner.

Foundry Equipment Co., Cleveland, exhibited photographs of installations of its ovens, and sections of oven panels used in the ovens made by the firm.

Paul Maehler Co., Chicago, displayed two small core ovens; one of which was electrically heated and

the other gas fired. The firm's display also included one of its oven heaters, and a recirculating air heater sectioned to show its construction.

Several firms exhibited melting units and accessories for such units. Monarch Engineering & Mfg. Co., Baltimore, showed several sample furnaces. A 500-pound furnace was displayed by Detroit Electric Furnace Co., Detroit. The firm also showed a number of representative castings in bronze, gray iron, malleable cast iron, brass and alloy steel made from metal melted in its furnaces. Ajax Electric Furnace Co., Philadelphia, featured a sectional model of its low frequency-type, electric induction furnace. Two high-frequency-type induction furnaces were shown by Ajax Electrothermic Corp., Trenton, N. J. One has a capacity of 1000 pounds, and the other, a laboratory-type furnace, has a capacity of 17 pounds. Various types of stainless steel castings made from metal melted in the furnaces were displayed also.

Pittsburgh Electric Furnace Corp., Pittsburgh, featured photographs showing typical installations of its furnaces, and castings in gray iron, steel and malleable iron made from metal melted in the furnaces. Grindle Fuel Equipment Co., Harvey, Ill., displayed a unit coal pulverizer, and a model showing its construction. Photographs depicting typical installations of equipment manufactured by the Whiting Corp., Harvey, Ill., were shown. Blue prints, charts and photographs of a device to preheat the blast for the cupola featured the exhibit of Griffin Engineering Co., Chicago. Two gas-fired melting furnaces for nonferrous metals, and a special burner were shown by Campbell-Hausfeld Co., Harrison, O.

An electrically controlled centrifugal blower for maintaining a constant supply of air for the cupola was featured by General Electric Co., Schenectady, N. Y. The device was in operation to show the method of control. The firm also displayed a device employing a photoelectric lamp for control purposes. Two turbo-compressors for cupolas were exhibited by Spencer Turbine Co., Hartford, Conn.

Several firms displayed various types of molding and core sands for brass, bronze, gray iron, malleable cast iron and steel molding. These included Albany Sand & Supply Co., Albany, N. Y.; Ayers Mineral Co., Zanesville, O.; Great Lakes Foundry Sand Co., Detroit; Industrial Minerals Co., Columbus, O.; Standard Silica Co., Chicago, and the White Rock Silica Co., Chicago. Harry W. Dietert Co., Detroit, exhibited a line of equipment for testing molding sand, core sand, and the molds after they are put up.

Graphite crucibles, graphite refractories, and fireclay refractories were displayed by several firms. Graphite materials were shown by Joseph Dixon Crucible Co., Jersey City, N. J.; Lava Crucible Co. of Pittsburgh, Pittsburgh; and Vesuvius Crucible Co., Swissvale, Pa. Laclede-Christy Clay Products Co., St. Louis, exhibited its line of special refractories for gray iron, malleable cast iron, steel, and brass. Brick, tile, special shapes and refractory cements with photographs of installations of its recuperator, and models showing the applications of the refractories and cements constituted the exhibit of Refractories division, Carborundum Co., Perth Amboy, N. J. Electro Refractories Corp., Buffalo, displayed crucibles, patching cement and carbide of silicon refractories.

Bethlehem Steel Co., Bethlehem, Pa., showed samples of the various types of pig iron that it manufactures for foundry use, specimen castings made with the irons, and photographs of other castings. Superior Charcoal

Sand Conditioning Apparatus, Grinders, Plates and Hoists Were Shown

Iron Co., Grand Rapids, Mich., displayed samples of its pig iron. Nonferrous metals and alloys in ingot form, including aluminum, brass,, bronze, and nickel alloys were exhibited by the British Aluminum Co. Ltd., New York; Ajax Metal Co., Philadelphia; H. Kramer & Co., Chicago, and Electro Alloys Inc., Buffalo.

Clays for bonding and rebonding molding sands were shown by Eastern Clay Products Inc., Buffalo, and Illinois Clay Products Co., Joliet, Ill. Foundry coke and protective paints were shown by Semet-Solvay Co., New York, and St. Louis Gas & Coke Corp., St. Louis, had its booth fitted as a lounge for visitors. A number of castings of different types to show the application of a special process for producing gray iron constituted the display of the Meehanite Research institute, Chattanooga, Tenn.

Material handling equipment occupied a prominent position in the exhibition pictures. Cranes, hoists, buckets, conveyors, trucks, monorails, in fact practically every type of equipment utilized in the solution of material handling problems in the foundry industry were on display. As an interesting departure from the previous exhibitions, six manufacturers of electric hoists were located in adjacent booths in the exhibition hall. Those represented in that group were Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.; American Engineering Co., Philadelphia; Northern Engineering Works, Detroit; Harnischfeger Sales Corp., Milwaukee; Euclid Crane & Hoist Co., Euclid, O.; and Chisholm-Moore Hoist Corp., Tonawanda, N. Y.

Shepard Niles Crane & Hoist Corp. showed several electric hoists, including two floor operated types of ½ and 2 tons capacity. A standard 3-ton crane trolley and a section of a hoist showing the construction also were shown. American Engineering Co. operated three electric hoists of a type designed for low head room. These hoists were of ¼, 1 and 2-ton capacity. A 1-ton electric hoist mounted on an overhead frame and monorail was shown in operation by Northern Engineering Works. Harnischfeger Sales Corp. displayed two electric hoists, one equipped for push button control and the other provided for variable speed operation. Euclid Crane & Hoist Co. operated four types of electric hoists, three of 1-ton capacity and one handling 1000 pounds, all designed for operation with low head room. Chisholm-Moore Hoist Corp. exhibited a variety of electric and hand power chain hoists.

Three electric hoists ranging in capacity from 500 pounds to 1 ton were displayed by McCullom Hoist Co., Downers Grove, Ill. A wide variety of monorail equipment was displayed on a special rack by the Louden Machinery Co., Fairfield, Iowa. Several types of buckets for handling sand and other bulk materials were shown, Hayward Co., New York, exhibiting a working model of a clam shell bucket operated by an electric motor. Other models of clamshell and orange peel buckets also were displayed by that company. Blaw-Knox Co., Pittsburgh, showed a large, hook-on-type, single line, clamshell bucket.

One section of a runaround car type mold conveyor, conveyor parts and photographs of conveyor installations were featured by C. O. Bartlett & Snow Co., Cleveland. An exceptionally attractive display was arranged by Link-Belt Co., Chicago, with a special metallic background adding to the display. Equipment

Artistic Settings Displayed Equipment to Advantage in the Booths

shown by that company included a vibrating shakeout riddle, a revivifier for molding sand, several speed reducers and a section of an apron conveyor. Mathews Conveyor Co., Ellwood City, Pa., showed a special testing rack to illustrate the efficiency of the bearing seal against the entrance of sand. The company also displayed a recently developed ball transfer and a line of roller conveyors ranging in capacity from 30 to 8000 pounds per roller. An aerator for conditioning sand and samples of leak-proof, apron conveyors were featured by Chain Belt Co., Milwaukee.

A line of roller conveyor equipment and a loop of the type made by the company was displayed by Standard Conveyor Co., North St. Paul, Minn. A variety of conveyor equipment also was shown by Samuel Olson & Co., Chicago. Gasoline driven trucks for foundry use were exhibited by Clark Tructractor Co., Battle Creek, Mich. The display included three models, one of the platform lift type, another equipped with a scoop for handling bulk materials, such as sand and the third designed to handle annealing boxes.

As in the past, the displays of equipment employed in cleaning castings attracted considerable attention. American Foundry Equipment Co., Mishawaka, Ind., exhibited a new combination type tumbling and sandblast cleaner equipped with an air lift for the sand. A machine for aerating and conditioning molding sand also was shown. Pangborn Corp., Hagerstown, Md., featured a sandblast helmet with complete equipment and photographs of installation of sandblast and dust arrester installations. Sandblast and dust arrester equipment and photographs of installations were exhibited by Parsons Engineering Corp., Cleveland.

W. W. Sly Mfg. Co., Cleveland, showed its line of cleaning room equipment with the aid of photographs. A direct pressure sandblast generator, a small sandblast gun and an operator's helmet were shown by Ruemelin Mfg. Co., Milwaukee. Macleod Co., Cincinnati, displayed a new type sandblast cabinet, a rotary type

All the Available Exhibition Space Was Filled with Attractive Displays

sandblast barrel, oil burning torches and a blacking sprayer; and New Haven Sand Blast Co., New Haven, Conn., illustrated its line of equipment with photographs.

Equipment for grinding and snagging castings was featured at several interesting and exceptionally attractive displays. A line of bakelite bonded and vitrified grinding wheels for regular and high speed work was displayed by the Abrasive Co., Philadelphia. Black & Decker Mfg. Co., Towson, Md., showed a variable speed, alternating current, stand grinder using a 24-inch wheel, a similar type swing frame grinder, and a variable speed, direct current, stand grinder also using a 24-inch wheel. A line of abrasive products were displayed by Carborundum Co., Niagara Falls, N. Y., against a beautiful background of carborundum crystals and colored lights.

A large, high speed, heavy duty snagging grinder equipped with quick speed change to compensate for wear of wheels, was featured by Kling Bros. Engineering Works, Chicago. In addition to a variety of grinding wheels, Norton Co., Worcester, Mass., exhibited a large stand grinder and a swing frame type grinder. Grinding wheels and photographs of installations were displayed by Safety Grinding Wheel & Machine Co., Springfield, O. Samples of grit and shot for foundry use were shown by Globe Steel Abrasive Co., Mansfield, O., and Steelblast Abrasive Co., Cleveland. One of the attractive displays found in the ballroom featured cutting and welding apparatus and other equipment made by Air Reduction Sales Co., New York.

A variety of core binders including linseed oil, linseed oil base, dry binders and compounds were shown by a number of companies, including Advance Milling Co., Chicago, Corn Products Refining Co., New York, Federal Foundry Supply Co., Cleveland, Spencer Kellogg & Sons Sales Corp., Buffalo, Knefler-Bates Co., Indianapolis, Chas. A. Krause Milling Co., Milwaukee, Lindsay-McMillan Co., Milwaukee, Werner G. Smith Co., Cleveland, Smith Oil & Refining Co., Rockford, Ill., and Swan-Finch

Exhibits Were Located in the Exhibition Hall and the Grand Ballroom

Oil Corp., Chicago. In numerous instances, these companies also displayed intricate cores in which the particular type of binder displayed was used. Graphite, plumbago blacking, core wash, and parting compound were included in the display of Superior Flake Graphite Co., Chicago. A variety of facings and a Lycoming motor containing castings made with these facings were featured by Kelly Graphite Mills Inc., Stockerton, Pa. United Compound Co., Buffalo, exhibited its line of vent wax.

Although molding machines were not exhibited in the number and variety usually seen, practically all the manufacturers of that type of foundry equipment were represented. The sand, dust and bustle of exhibits where the molds actually are made, poured and shaken out were absent but several of the machines were connected to the air line and shown under operating condition.

Adams Co., Dubuque, Iowa, showed a new model of a jolt, squeeze machine mounted on wheels and a smaller jolt, rollover machine in which the table is locked to the platen designed to jolt as a unit. That company also showed snap flasks, slip flasks and a new type rolled steel flask.

Arcade Mfg. Co., Freeport, Ill., had on exhibit several types of molding and coremaking machines, steel flasks and wooden snap flasks. Beardsley & Piper Co., Chicago, had a large booth fitted up with chairs for visitors from which they might view moving pictures of the company's installations in various plants.

A core blowing machine in the booth of Wm. Demmler & Bros., Kewanee, Ill., was shown in operation with a sand hopper discharging on to a revolving plate which fed sand to a bucket conveyor carrying the sand to the magazine of the machine. International Molding Machine Co., Chicago, showed several types of the company's mold and core making machines.

Herman Pneumatic Machine Co., Zelienople, Pa., had on exhibition a jar rollover molding and a jolt machine equipped with automatic fluid timing valves to regulate the speed and number of strokes for any given mold.

In addition to a jolt, rollover pattern draw molding machine equipped with a run out table, Johnson & Jennings Co., Cleveland, exhibited drawings and photographs of its line of machines. Moline Iron Works, Moline, Ill., exhibited a squeeze machine mounted on wheels to straddle the heap. This machine presented a striking appearance decked out in aluminum paint with several parts nickeled.

Wm. H. Nicholls Co. Inc., Richmond Hill, Long Island, N. Y., had several machines including a new type rollover squeeze machine in which the mold is rolled over during the squeezing operation. No clamps are required and the pattern is drawn on the reverse stroke of the squeeze piston.

Osborn Mfg. Co., Cleveland, ex-

(*Concluded on Page* 83)

Refractories and Abrasives Were Shown by Several Manufacturers

Core Binders and Molding Machines Featured Some of the Exhibits

The FOUNDRY Family Photograph Album

©Bachrach

Upper Left

C. TOLAN JR.

Dodge Steel Co., Philadelphia

Upper Right

E. M. HANDLEY

Chain Belt Co., Milwaukee

Lower Left

C. B. MITCHELLA

Adamson Machine Co., Akron, O.

Lower Right

L. W. SPRING

Crane Co., Chicago

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

TENTATIVE SPECIFICATIONS FOR

ALUMINUM-BASE ALLOY CASTINGS

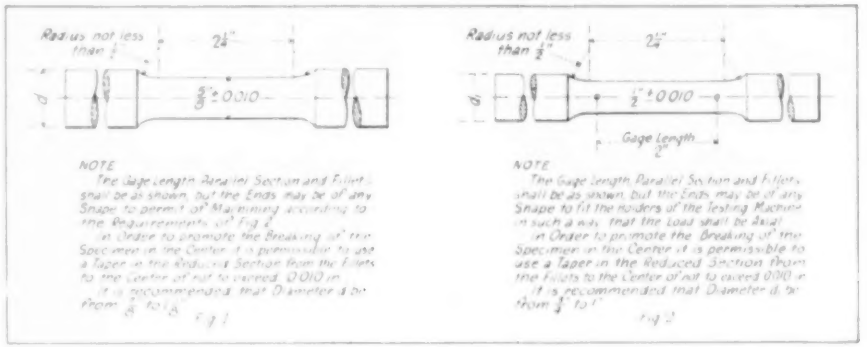
(*Continued from Data Sheet No.* 860)

(b) If any test specimen shows defective machining or develops flaws it may be discarded; in which case the manufacturer and the purchaser or his representative shall agree upon the selection of another specimen in its stead.

INSPECTION AND REJECTION

(a) Inspection may be made at the manufacturer's works where the castings are made, or at the point at which they are received, at the option of the purchaser.

(b) If the purchaser elects to have inspection made at the manufacturer's works, the inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all


Radius not less than ½"
2½"
D
⅝ ±.0010
NOTE
The Gage Length Parallel Section and Fillets shall be as shown, but the Ends may be of any Shape to permit of Machining according to the Requirements of Fig 2
In Order to promote the Breaking of the Specimen in the Center it is permissible to use a Taper in the Reduced Section from the Fillets to the Center of not to exceed .0010 in
It is recommended that D-diameter d be from ⅝ to ⅞
Fig 1
Radius not less than ½"
2½"
S
½ ±.0010
Gage Length 2"
NOTE
The Gage Length Parallel Section and Fillets shall be as shown, but the Ends may be of any Shape to fit the holders of the Testing Machine in such a way that the Load shall be Axial
In Order to promote the Breaking of the Specimen in the Center it is permissible to use a Taper in the Reduced Section from the Fillets to the Center of not to exceed .0010 in
It is recommended that D-diameter d be from ½" to ¾"
Fig 2

Dimensions of Test Bars

parts of the manufacturer's works which concern the manufacturer of the material ordered. The manufacturer shall afford the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Castings which show injurious defects revealed by machining operations subsequent to acceptance may be rejected, and if rejected shall be replaced by the manufacturer without charge to the purchaser. The full weight of the original material rejected material rejected shall be returned to the manufacturer.

EXPLANATORY NOTES

Note 1.

Alloy A has a specific gravity of about 2.83. In pattern design a shrinkage of about 0.156 (5/32)-inch per foot should be allowed. This alloy was for

(*Continued on Data Sheet No.* 862)

TENTATIVE SPECIFICATIONS FOR

ALUMINUM-BASE ALLOY CASTINGS

(*Continued from Data Sheet No.* 861)

years the standard and is still somewhat used but is being superseded by *Alloy B*.

Alloy B has approximately the same specific gravity and shrinkage as *Alloy A*. It is superseding *Alloy A* as it possesses better casting characteristics, especially in the more difficult work where higher pouring temperatures than those usually employed are found necessary. The tendency towards cracks and shrinkage is considerably overcome by the careful control of the iron and silicon contents. This alloy is used for general casting purposes.

Alloy C has a specific gravity of about 2.83 to 2.86. The pattern shinkage is about 0.156 (5/32)-inch per foot. It has somewhat better machining qualities than *Alloys A* and *B*. It is used for about the same purposes as *Alloy B*, particularly for automotive work, such as crank and transmission cases and similar parts.

Alloy D is very similar to *Alloy C* in both properties and uses. Due to its higher silicon content it has greater fluidity and is less subject to cracking. It is used for the more intricate general casting work.

Alloy E has a specific gravity of about 2.95 and the pattern shrinkage is 0.156 (5/32)-inch per foot. It is used for pumps, manifolds, and general castings which should be leak proof. The high copper content makes the alloy more brittle and lowers its shock resistance.

Alloy F has a specific gravity of about 2.90 and the pattern shrinkage about 0.156 (5/32)-inch per foot. The alloy is used for pistons, valve guides, and bearings or other parts where hardness and good bearing qualities are essential.

Alloy G has a specific gravity of about 2.78. It is for general casting purposes where lightness and higher strengths are desired. It is more resistant to corrosion than the other copper alloys. The various strengths are obtained through different heat treatments. Heat treatment No. 1 gives maximum elongation and resistance to shock. It is a solution heat treatment and may be specified where the most rugged service is required. An aging effect takes place on standing which increases the strength and slightly decreases the elongation. Heat treatment No. 2 is a solution and precipitation heat treatment, and should be specified where a higher initial strength, yield point, and hardness are desired. Heat treatment No. 3 should be specified where the highest strength is desired. This alloy is used in general for high-strength parts in street cars and busses, parts for internal combustion engines, outboard motor parts and other marine castings.

(*Concluded on Data Sheet No.* 863)

(*Concluded from Page* 80)

hibited photographs and drawings of the machines made by the company in operation in various plants. An oil controlled rollover jolt machine featuring improved rollover equipment was shown by Tabor Mfg. Co., Philadelphia. All the operating mechanism is enclosed in a substantial cast iron housing.

Design of modern production and jobbing foundries was illustrated in photographs, drawings and floor plans, by Austin Co., Cleveland. Foundry surveys and reports also were included and photographs displayed the layout of a modern tractor plant.

Pattern Equipment Featured

Various types of flasks and pattern equipment were shown by a large group. Fort Pitt Steel Casting Co., McKeesport, Pa.; Sterling Wheelbarrow Co., Milwaukee; Moltrup Steel Products Co., Beaver Falls,Pa., were among those exhibiting steel flasks. The latter company displayed aluminum and steel pattern plates, finished and unfinished mechanical plates, bottom plates and core plates. Sterling Wheelbarrow Co. also included wheelbarrows and foundry specialties in the flask exhibit. Electro-Chemical Pattern & Mfg. Co., Detroit, had copper metal pattern equipment on display. Stone Pattern Mount Co. Inc., Bloomfield, N. J., featured matchplates, pattern mounts, squeezer plates, and core boxes of a nonshrinking compound. Edward Hines Lumber Co.,Chicago, featured a special soft pine pattern lumber, and displayed patterns that have withstood long usage, including a car wheel pattern made 30 years ago and used in making castings up until a year ago.

Many foundry specialties were shown, including valves, door mechanisms, core transports and safety devices. Schoelkopf Mfg. Co., Madison, Wis., had door operators for folding or sliding doors, and Chicago Mfg. & Distributing Co., Chicago, displayed a pneumatic core transport, bag holder truck, chipping hammers and flasks. Galland-Henning Mfg. Co., Milwaukee displayed a stock of valves for air, gas, water and oil. Charles C. Kawin Co., Chicago, presented information on foundry advisory service and analysis. American Brake Shoe & Foundry Co., Chicago, showed annealing pots, plates and stools. Metallography and commercial X-ray work was featured by several exhibitors, including Claud S. Gordon, Chicago; Bausch & Lomb Optical Co., Rochester, N. Y.; and General Electric X-Ray Corp., Chicago. Films, illuminators and X-ray diffraction also was shown by Kelley-Koett Mfg. Co. Inc., Covington, Ky. Bell & Howell Co., Chicago, demonstrated the application of slides, continuous motion and talking motion pictures and their application to industry.

Safety clothing and equipment included among others, the exhibit of safety shoes with steel inserts by Safety First Shoe Co., Framingham, Mass.

Various committees of the American Foundrymen's association arranged attractive displays to show the work they are carrying on. These included the castings and patterns submitted by apprentices in the annual contests; sand testing equipment recommended by the committee on sand grading and testing; data on the work carried out at the bureau of standards under the direction of the gray iron committee; charts depicting the type of instruction in engineering and trade schools including some from Germany and France. One booth was devoted to posters showing the scope of the American Foundrymen's association in relation to industry and to the individual.

Gray Iron institute, Cleveland, had its booth fitted as a lounge for visitors, and distributed pamphlets on its activities. American Society for Testing Materials, Philadelphia, displayed charts showing the work it is carrying on in industry, and the various publications that are distributed to its members. American Standards association, New York, and American Society of Mechanical Engineers, New York, had exhibits also describing their activities in industrial fields. National Founders' association, Chicago, distributed bulletins containing information on its activities, and displayed safety equipment it recommends for foundry use.

Show Sand Samples

One of the interesting points of the exhibition was the display of sand samples from the different states, Canada, and foreign countries which were collected by Eugene W. Smith, for the past 59 years connected with the Crane Co., Chicago. Mr. Smith always has been an active proponent in spreading the doctrine that knowledge of foundry sands is important to foundrymen, and developed the vibratory test for the determination of sand characteristics.

The entire exhibition was directly under the supervision of C. E. Hoyt, executive secretary of the American Foundrymen's association. W. H. Schulte, Chicago, was superintendent of installation, F. C. Balthaser, Chicago, assistant superintendent of installation, and A. C. Hess, traffic manager. Mr. Schulte, Mr. Balthaser, and Mr. Hess have been connected with the A. F. A. exhibits for many years.

Grant Pierce, formerly head of the National Radiator Co., Providence, R. I., has been appointed vice president in charge of sales for the H. B. Smith Co., Westfield, Mass.

Institute Meets During A.F.A. Convention

A special meeting of the Gray Iron institute, arranged by co-operation with the American Foundrymen's association, was held at a luncheon Wednesday, May 6, and was attended by more than 100 officers, members, and guests. A. F. Lamme, Elizabeth Street Foundry, Chicago, who presided, is chairman of the Chicago district group of the institute. B. H. Johnson, Florence Pipe & Foundry Co., Florence, N. J., introduced various committee chairmen who reported upon the numerous activities of the organization. The cost committee has arranged to provide general supervision of acounting methods for member companies and cost advisors are working in the various territories making at least two calls a year after proper cost systems are installed.

H. B. Hanley, American Laundry Machinery Co., Rochester, reviewed the work of the technical committee which through the services of Oliver Smalley and W. W. Kerlin is compiling and distributing technical information to the membership. Mr. Smalley, in commenting upon this work, spoke of the investigation of the elastic properties of gray iron, the proposed advancement of new specifications, the improvement of casting properties of member plants and the interpretation of gray iron and its uses to engineers.

J. H. Bruce, Bowler Foundry Co., Cleveland, illustrated the definite relationship between the technical work now being furthered and merchandising. A distinct accomplishment of the merchandising committee is the recent approval of the Gray Iron institute trade customs by the National Association of Purchasing Agents.

A. J. Tuscany, manager of the institute, summarized and interpreted the work of the various committees and staff personnel. He analyzed this work in relation to the definite plan upon which the institute was established. Other speakers at the institute meeting included Henry S. Chafee, Builders Iron Foundry,Providence, Philip Frankel, Cleveland, W. J. Grede, Liberty Foundry Co., Wauwatosa, A. E. Hagebocck, Frank Foundries Corp., Moline, Walter Seelbach, Forest City Foundries Co., Cleveland, Henry Spilker, Sterrit-Thomas Foundry Co., Pittsburgh, and W. O. Axtel, Century of Progress Exposition, Chicago.

Ernest H. Du Vivier, 30 Church street, New York, has been appointed representative in Metropolitan New York and Northern New Jersey by the Illinois Testing Laboratories, 141 West Austin avenue, Chicago. F. W. Fernald, 335 Fifth avenue, Pittsburgh, will represent that company in Western Pennsylvania and West Virginia.

A. G. Storie | W. D. Moore | N. K. B. Patch | Fred L. Wolf | Dan M. Avey

A. F. A. Directors Are Elected

AT THE business meeting of the American Foundrymen's association at Chicago, Thursday, May 7, announcement was made of the election of five members to the board of directors. The following were elected for a three-year period: N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo; W. D. Moore, president, American Cast Iron Pipe Co., Birmingham, Ala.; Fred L. Wolf, head of the development engineering, technical and plant control departments, Ohio Brass Co., Mansfield, O.; Dan M. Avey, editor, THE FOUNDRY, Cleveland, and A. G. Storie, vice president, Fittings Ltd., Oshawa, Ont.

Retiring President Elected

Nathaniel K. B. Patch, retiring president of the American Foundrymen's association, was born in Franklin township, Houghton county, Mich., Feb. 15, 1879. He received his early education in the public schools of Hancock and Hubbell, Mich., and Buffalo. In 1897 he entered Massachusetts Institute of Technology but was forced to abandon his studies in 1900 because of eye trouble. From 1900 to 1901 he was employed by the Buffalo Smelting Works, Buffalo, in various capacities. On Jan. 1, 1901 Mr. Patch joined the sales force of the Lumen Bearing Co., Buffalo, and continued in that capacity until July, 1904 when he was made manager of the Canadian branch at Toronto, Ont. In April, 1912 he returned to the Buffalo plant to act as secretary of the company and plant engineer, and in 1913 he was advanced to the position of general superintendent of the Buffalo plant. Later, he was made works manager, but continued as secretary through the various changes. Mr. Patch has been active in the work of the American Foundrymen's association for many years as chairman of many committees including the correlation committee and as a director of the association. He was elected vice president in 1929 and president in 1930.

W. D. Moore

W. D. Moore was born in Hannibal, Mo., April 17, 1882, was educated in the public schools of Galion, O., and was graduated from the high school of that city in 1900. In 1907 Mr. Moore went to Birmingham, Ala., and for a brief time was connected with the Tennessee Coal, Iron & Railroad Co. In 1908 he became associated with the American Cast Iron Pipe Co. as an engineer. He worked his way through the various departments of the company becoming vice president and works manager in 1922, and president in 1924. Mr. Moore is a prominent figure in the cast iron pipe industry, and is the inventor of the process of casting pipe centrifugally in sand molds. He takes active part in civic affairs, and is a member of many national organizations.

Fred L. Wolf

Fred L. Wolf was born in Elmore, O., May 13, 1885, and received his early education in the public schools of that city and Toledo, O. He was graduated from the University of Michigan in 1908 with the degree of bachelor of science in chemical engineering. After his graduation he spent two years at Cobalt, Ont. in charge of development work on mining claims and in 1911 became associated with the Ohio Brass Co., Mansfield, O. as chemist and later became manufacturing engineer. Mr. Wolf has been a prolific writer on many industrial subjects, both for associations and the technical press. Many of his articles have been on foundry subjects, and on several occasions have been contributed to annual meetings of the American Foundrymen's association. He is active on committee work of the American Society for Testing Materials and the American Electric Railway association. Mr. Wolf also is a member of the American Institute of Mining and Metallurgical Engineers, American Chemical and other societies.

A. G. Storie

A. G. Storie, vice president, Fittings Ltd., Oshawa, Ont., was born in Oshawa in 1879. After finishing public school, he entered the employ of the Ontario Malleable Iron Co., Oshawa in 1895, and spent his first year in the coremaking department. He then entered the pattern making department and served 4 years apprenticeship to the patternmaking trade. Upon completion of his apprenticeship, Mr. Storie was given the opportunity of taking up general foundry practice. He took the opportunity, and worked for several years progressing from one department to another learning the various branches of the foundry business. He then was appointed assistant to the superintendent and later general superintendent. He held that position until 1918 when he resigned from the Ontario Malleable Iron Co., Oshawa, and took a position with Fittings Ltd., Oshawa, as manager of malleable and gray iron foundries. In 1919, he was elected vice president of Fittings Ltd.

Dan M. Avey

Dan M. Avey was born in Charleston, Ill., May 3, 1888. He received his education in the public and high schools of Mattoon, Ill., and was graduated with a degree of bachelor of science in civil engineering from the University of Illinois in 1910. He served as associate editor, *Munici-*

(Continued on Page 92)

Prevent Losses With Proper Gates and Risers

By Pat Dwyer

THEORETICALLY a casting should be poured in a manner to promote progressive freezing from the farthest point to the gate, or to the riser where one is employed for the purpose of feeding the casting. Theoretically also, it should be possible to figure in advance the size of the gate and the pouring speed best suited to give the best results. In developing the mathematics of gating a casting, H. W. Dietert determined by experiment the pouring time on a wide variety of castings in six foundries. These castings ranged in weight from the smallest up to 1000 pounds. Mold dimensions varied from 6 x 10 inches to 6 x 6 feet.

Formulas Are Available

By plotting the weight of the casting against the pouring time, it was found that a line drawn through the average of the numerous points obtained, gave a smooth curve as shown in Fig. 44. By grouping the various thicknesses of metal stocks, curves *A*, *B* and *C* were obtained. These curves known as the pouring time, are used as follows: Assume that the predominating thickness of wall thickness is ¼-inch and the casting weight, 100 pounds, and it is desired to find the time required for pouring the metal. Using curve *B*, find the weight of the casting at the bottom of the chart. Follow the line at 100 pounds upward to where it intersects the curve *B*. This point corresponds to 12.5 seconds, the proper pouring time for a casting 100 pounds, ¼-inch thick, poured one up with iron between 2400 and 2500 degrees Fahr.

The correct pouring time also may be calculated from the following formula *A:*

$$\text{Pouring time in seconds} = S\sqrt{W}$$

Where

W = Weight of casting in pounds

$$S = \begin{cases} 1.1 \text{ for a casting with } 7/64 \text{ to } 9/64\text{-inch stock} \\ 1.25 \text{ for a casting with } 10/64 \text{ to } 20/64\text{-inch stock} \\ 1.5 \text{ for a casting with } 21/64 \text{ to } 39/64\text{-inch stock} \end{cases}$$

The calculated pouring time will check with the pouring time obtained from the curves given in Fig. 44. The gating principle may be applied in several ways. For example: Use a stop watch to time the pouring of a casting. If the time is 28 seconds for a 400-pound casting with a thickness of 5/16-inch and the chart shows that the pouring time should be 26 seconds, the size of the gate may be increased. From the foregoing it is apparent that with a little study and experiment, standards can be adopted to suit a wide variety of castings in gray iron and other metals.

Calculate the Area

FORMULAS now are available for calculating in advance the size of the gate, the height of the sprue and the proper pouring time for almost any given casting. Application of these formulas takes another of the variable factors out of foundry supervision and should prove a decided asset in any standardization program. Porous or dirty areas in a casting may be due to a dirty gate or to foreign material that floated in through a gate improperly designed to cope with such a contingency. In some instances the gate is blamed unjustly for a condition due to other causes. Excess gas or steam in a mold will cause agitation of the metal and the formation of a sulphur-manganese compound that may lodge in any part of the mold and form a porous or leaky area. Prominent foundrymen conducted interesting series of experiments to determine this point.

The rate at which molten metal will flow through a gate will depend on the ferrostatic pressure on the reduced section of the gate, known as the *choke* or *check*. The ferrostatic pressure will depend upon the height of the sprue and the location of the casting in the mold. When the mold fills with iron, the height of the sprue is diminished. Therefore the effective sprue height is the item of interest. The first step in calculating the area of the choke is to determine the effective sprue height by the following formula *B:*

$$\text{E.S.H.} = \frac{2H \times C - (P)^2}{2C}$$

Where

H = Height of sprue above the choke

C = Height of the casting

P = Height of the casting above the parting line

Fig. 43 gives diagrams illustrating the various types of parting lines. All dimensions should be in inches.

The area of the choke required to feed a casting properly depends upon the pouring time required for proper cooling and effective sprue height. The area in square inches of the choke may be calculated by the following formula *C:*

$$\text{Area of choke} = \frac{X\sqrt{W}}{\sqrt{\text{E.S.H.}}}$$

Where

W = Weight of casting in pounds

E.S.H. = Effective sprue height obtained from Formula B

$$X = \begin{cases} 0.38 \text{ for castings with } 21/64 \text{ to } 39/64\text{-inch stock} \\ 0.32 \text{ for castings with } 10/64 \text{ to } 20/64\text{-inch stock} \\ 0.28 \text{ for castings with } 7/64 \text{ to } 9/64\text{-inch stock} \end{cases}$$

Try an Example

Assume that the casting is 3/16-inch thick, weighs 100 pounds and will be gated at the parting line as shown at the bottom of Fig. 43. Following formula *B*, the value for *P* is 15 inches; *C* is 26 inches and *H* is 20 inches. The calculations follow:

$$\text{E.H.S.} = \frac{2H \times C - (P)^2}{2C} \text{ or}$$

$$\text{E.H.S.} = \frac{2 \times 20 \times 26 - 15^2}{2 \times 26}$$

$$\text{E.H.S.} = 15.7 \text{ inches}$$

$$\text{Area of choke} = \frac{X\sqrt{W}}{\text{E.S.H.}}$$

$$\text{Area of choke} = \frac{0.32\sqrt{100}}{15.7}$$

$$\text{Area of choke} = 0.81 \text{ sq. in.}$$

With a cross sectional area of 0.81 inches, the pouring time approximately will be 12.5 seconds.

The foregoing principles were worked out and applied in a group of foundries operated by a large corporation and the figures probably will vary to some slight extent if applied elsewhere and under other conditions.

Formula *A* will hold for all metals and various thicknesses. The constant *S* should be determined carefully for individual conditions outside those specified. Formula *B* for determining effective sprue height will hold for any metal. Formula *C* for calculating the area of the choke will hold for any metal. The constant *X* will have to be determined for each metal and thickness other than those shown.

Calculate in Advance

The area of the choke for each new job can be calculated in advance to eliminate the experimental gating period. Rule of thumb methods and experimental gating over a period of many years have evolved fairly standardized gating systems in the majority of foundries. With the foregoing formulas for a basis, the foundryman can set down this experience in definite figures for his own further guidance or for the guidance of others.

So far as available records show, the work of Mr. Dietert is the first effort to reduce the elusive subject of pouring iron, to an exact science. Something definite instead of loose guessing. Something which enables one man to pass information on to another in a manner within the comprehension of the second man.

The system admittedly is not perfect and may have to be adapted to a considerable extent before it is applicable under all conditions, but it is a long and gratifying step in the direction of ultimate standardization of all processes connected with the production of castings.

After a long period of close application, observation of his own work and the work of others, the old time foundryman developed a species of instinct which led him to select the right size, type and position of gate. The only measuring instrument he had was his eye and unfortunately he could not lend that eye to any other person in search of information. Usually he could not even specify offhand the sectional cross area of the gate in inches, but he could select a gate stick of the right size to serve his purpose, if several different sizes were available for selection. He had to see the gate stick and appraise it with his own eyes before arriving at a decision. Knowledge of this kind is difficult to transmit.

Under present conditions where the size, shape and position of the gate are not left to the decision of the molder, some definite base or foundation is required by the man in charge of operations either in the foundry or the pattern shop. In many instances this man has had little or no actual molding experience and therefore has had no opportunity to develop an unerring instinct in the selection of the ideal gate and runner for any given casting.

He is in the same position as the young man of a former generation confronted by the problem of grading iron by fracture. The old man could do it, but he had no tangible means of transmitting his information. Then chemical analysis was introduced. With this tool in his hands the young man was in a better position than his old time contemporary to accurately control the quality of his product. The method for calculating gate sizes proposed by H. W. Dietert furnishes a common foundation on which men may work and compare results intelligently.

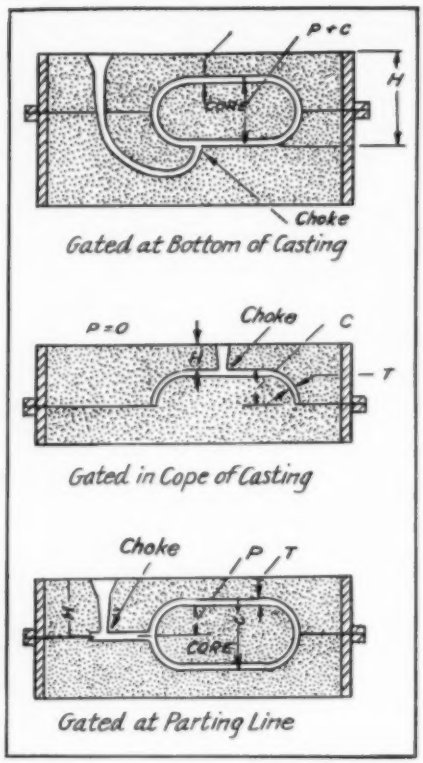


Fig. 43—Method of Applying Gating Theory Under Different Conditions

A recent analysis of defective castings indicates that the human element still is the weakest link in the cycle of operation incident to the production of castings. For this reason it is essential that every possible hazard should be removed and every precaution adopted. Instead of depending on the operator to step over any stumbling blocks in the path, these stumbling blocks should be removed in advance. Even where the path is swept and garnished, some of the men will stagger and slip before the end of the day.

The accompanying table gives a detailed list of the causes of a definite pile of defective castings and in nearly every one the gating system has been an important factor. Taking them in the order shown the cuts were caused by the gates. Drops and blows can not be blamed on the gates, but the missruns and the coldshuts probably are due as much to improper gates as they are to cold metal. Miscellaneous covers a multitude of sins and may or may not include the gates. Shrinkage in many instances is due to the gating system and while dirty castings may be the result of dirty molds, the chances are even that some of the dirt came either from or through the gates.

Terms Are Defined

The terms washing and scabbing are used synonomously, although to be strictly accurate they refer to defects from different causes. A *wash* is a surface defect caused by erosive action of the metal, usually near the gate. A scab is a defect where the sand has been removed by the action of steam. Sometimes both causes are responsible and the defect is a combined wash and scab. In some instances the word *cut* is employed instead of *wash*.

In some instances the character of the sand is responsible for washed areas. It is not sufficiently refractory or cohesive to resist either the heat or the force of the stream of metal. If it is too dry—this refers to green sand—it will crumble and wash ahead of the metal. If it is too wet or too hard the steam will throw it up in an attempt to escape.

A stream of molten metal falling from a great height, or entering at any other point in the mold with undue velocity may tear up the sand at the point of contact. The finishing tool occasionally encounters, and jumps over, small chilled pellets in a casting. In the majority of instances

Table II

Analysis of Defective Castings

1.	Molders' Defects, by weight:	
	(a) Cuts	2.35 per cent
	(b) Drops	7.92 per cent
	(c) Blows	5.00 per cent
	(d) Not run	7.30 per cent
	(e) Coldshut	8.13 per cent
	(f) Miscellaneous	38.10 per cent
	Total Molders' Defects	68.8 per cent
2.	Shrinkage	6.9 per cent
3.	Dirty Castings	17.4 per cent
4.	Foundry Breakage	6.9 per cent
	Total	100.0 per cent

these pellets are the result of metal spattering when it strikes the surface of the mold. They may be the result of careless pouring methods, gates not designed properly or wet sand. Steam from the wet sand causes the iron to boil and small globules are thrown above the surface to solidify and then fall back into the molten mass.

A series of experiments conducted by Walter Prince several years ago while he was connected with the Worthington Pump & Machinery Corp., indicated that causes other than improper gating are responsible for many defective castings that glibly are blamed on the gates. These defects are indicated by leaks under pressure, by porous, slushy areas in the casting, sometimes apparent and sometimes only revealed after a cut has been taken from the face of the casting in the machine shop.

Steam Causes Agitation

Suspicion based on his own observations were confirmed when he analyzed a defective area in the wall of a 60-inch pipe cast in a loam mold. The sample showed abnormal sulphur and manganese content, 25 per cent higher than the contents of these elements in an adjoining clean section of the casting.

He promptly placed the blame on agitation of the metal caused by steam from wet sand. To test the accuracy of his theory, he bored an ⅛-inch hole in the bottom of a 2000-pound ladle and connected an air jet. The metal was allowed to boil for 5 minutes over the air admitted from the bottom and an excessive amount of slag was found to accumulate on the top of the metal in the ladle.

Test bars poured from the metal before and after treatment showed a reduction of about 35 per cent in the sulphur content of the treated metal and a corresponding increase in the sulphur content of the slag. Repetition of this test showed that invariably a manganese and sulphur compound was formed and floated to the top in the form of slag.

The same conditions obtain in every mold where steam or gas causes agitation of the metal. Where the way is open, this form of slag may float to the top, but usually the material is held in contact with the mold face and the result is a porous or dirty area at this point when the casting has solidified.

It is common practice where pulleys and similar castings are poured with the tops of the rims open, for a man to watch the rising metal and to detach any of these accumulations from the vertical walls of the mold with a small rod.

This is the ninth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The tenth will appear in an early issue.—THE EDITORS.

Institute Group Meets

Approximately 75 members and guests of the Gray Iron institute attended the dinner meeting of the Northeastern Ohio group held in Cleveland, April 29. H. M. Schnerer, division of safety and hygiene, Industrial Commission of Ohio, Cleveland, made a plea for less accidents in foundries. He stated that during the past year 1814 accidents occurred in Cleveland foundries with 7 fatalities. Those accidents had a direct cost of $200,000, and an estimated indirect cost of four times that value, making a total cost of $1,000,000.

Following Mr. Schnerer's talk, Oliver Smalley, technical director, Gray Iron institute, presented an interesting discussion on metallurgical features and gray iron of the future. He mentioned the variance of opinion between the different countries on sizes of test bars for gray iron, and the tests to be applied. Gray iron is not one material but a family or series of alloys which vary considerably in physical properties. When properly made, it is a good engineering material, but the foundryman must understand certain metallurgical principles to produce the proper type of iron.

Mr. Smalley stated that with such knowledge, the foundryman can prove to the engineer that gray iron is a true alloy, that it has elastic properties, and it has toughness; all of which will answer the requirements of a good engineering material. He showed lantern slides of the structures of different types of gray iron to illustrate his points. Mr. Smalley stressed the value of melting and pouring iron hot, but not too fast. In production work he suggested the use of trial gates; making the first gate small enough to produce a slight cold shut. Then the gate is opened up slightly, and solid castings usually will result. He also mentioned the work that the Gray Iron institute is getting underway to collect metallurgical data, test bars, and test data in the various district groups.

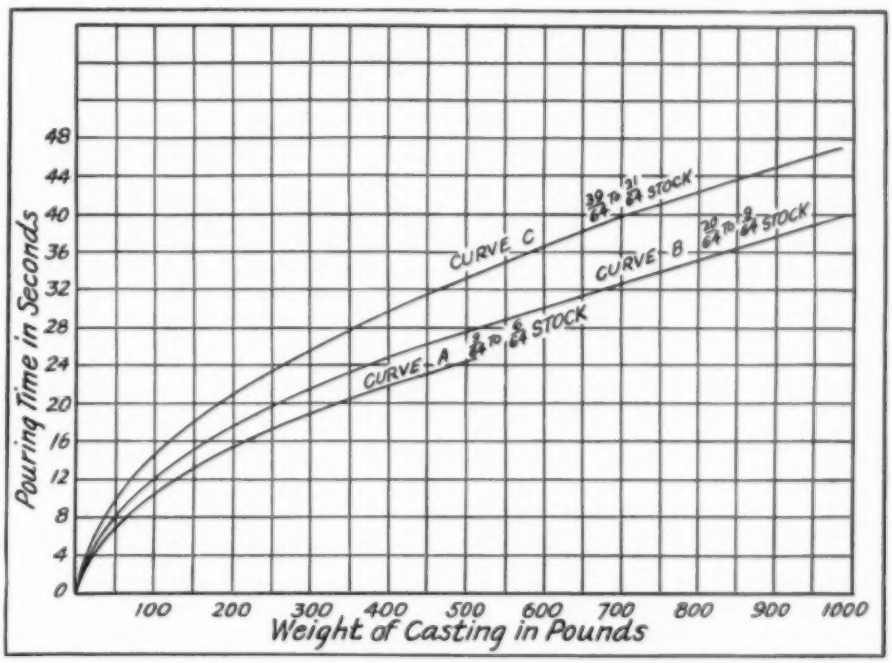


Fig. 44—Chart Showing Relationship Between Weight and Thickness of Casting and Pouring Time in Seconds

Institute Issues Fourth Technical Bulletin

Gray Iron institute, Terminal Tower building, Cleveland, recently issued the fourth of a series of technical bulletins. The first section deals with preliminary report of the consideration of standard practices which gives information on the structure of cast iron, facings and blackings. Parting compounds also are discussed. Information also is given on the classification of cast scrap for use in gray iron foundries. Those classifications given include that recommended by the U. S. department of commerce, division of simplified practice; American Foundrymen's association and the Railway Storekeepers.

William L. Hartley, formerly in charge of the foundry sales division, Link-Belt Co., Chicago, has been made district sales manager for the company's materials handling and positive power transmission equipment at Detroit. Mr. Hartley has been with Link-Belt company since 1915, except for a period during war service, and in 1927 was in the Kansas City district sales office of the company.

Questions & Answers on FOUNDRY PRACTICE

GENERAL

Buys Gear Tooth Stock

We have a large gear pattern to make in wood, and would like to know if we can purchase some ready made stock for the teeth. The pattern will be about 5½ feet in diameter with 132 teeth of 2 diametral pitch.

While in many patternshops, the teeth are made by hand or cut by special woodworking machinery, it is possible to purchase separate teeth of the proper length and cut to the right pitch. That type of work is a specialty operation, and it will be necessary to give all the information on the exact outside diameter of the gear, the pitch diameter, circular pitch, number of teeth, and the width of the face.

If you have many gears to make, it probably will be worth your while to investigate the possibilities of woodworking machinery which will cut the teeth on a pattern blank similar to the method in cutting metal gear blanks. For your information we are forwarding names of firms which may fill your needs.

Q & A

Acid Removes Scale

Will sulphuric acid alone cut through the scale on gray iron castings that are intended for iron patterns, or should nitric acid be added? What is a good acid mixture for that purpose, and what kind of a container should be used for the solution? Any other information you have which will enable us to obtain smooth iron patterns will be appreciated.

Sulphuric acid mixed with water in the proportions of 1 part acid to 10 parts water will remove the scale from gray iron castings. Muriatic (hydrochloric) acid mixed with an equal quantity of water also will remove the scale. If the scale mainly is sand, you can remove it without attack on the iron by employing a solution of hydrofluoric acid in water, say about 1 part acid to 15 parts of water. After the castings are pickled, they should be washed thoroughly in cold and then in hot water.

Wooden tanks of heavy cypress planking with the joints sealed with thick asphaltum paint and bolted together with copper bolts will be satisfactory for sulphuric and muriatic acid solutions. The tanks also should be coated well with asphaltum paint. If you only have a few castings to pickle, earthenware containers will be satisfactory for the acids named. However, in the case of hydrofluoric acid solutions, lead-lined containers are advised.

It is believed that if proper care is taken in molding, that you should not have much difficulty in obtaining smooth surfaces on your pattern castings, from which the sand will peal easily. One method is to coat the mold face with graphite or plumbago as it usually is called. Another way is to use a special facing sand containing seacoal in the ratio of 1 part of seacoal to 8 or 10 parts of half new and half old sand. It may be worthwhile to use a finer facing sand, and in any event, riddle a layer of sand on the pattern before throwing in the backing sand.

THIS department covers all problems relating to metallurgical, melting and molding practice encountered in making steel, malleable-iron and gray-iron castings. Questions submitted by bonafide subscribers to this department will be answered by members of the editorial staff of The Foundry, supplemented where occasion requires by the advisory staff whose personnel is as follows:

John H. Hall
Cast Steel

H. A. Schwartz
Malleable Cast Iron

J. W. Bolton
Gray Cast Iron

All questions must be addressed to the Editor, The Foundry, Penton Building, Cleveland.

Q & A

Plaster Not Hardened

What is added to ordinary plaster to make it suitable for permanent patterns? We have seen plaster matchplates which hardly could be scratched, scraped or cut with a sharp knife. They were clean and true after long usage.

The material you refer to is proprietary compound. Several varieties have been developed and can be secured from the manufacturers advertising in THE FOUNDRY. The material is mixed with water as in plaster of paris practice and poured into suitable molds. After it has set, the object or objects are removed from the sand and cleaned. Wires or other form of reinforcement may be placed in the mold, if necessary, for added strength in fragile parts.

Q & A

Rubber Binds Cores

We understand that the bureau of standards has developed a new rubber-cement binder for cores. Is it practical to use, and where can the rubber be purchased?

Experimental investigation and the results obtained by the bureau of standards on rubber core binders were published in the Nov. 1, 1928 issue of THE FOUNDRY. Advantages claimed are that the cores crush readily, have greater strength than green sand cores, are air dried, and have a high permeability and a freedom from blowing. Disadvantages are the inflammability of the solvents used, the cost of the binders and solvents, and the loss of solvent. Several types of rubber may be used, namely milled, smoked sheet rubber (vulcanized rubber can-

not be used); balata, and thermoprenes (a type of rubber cement).

Rubber cut into small pieces is dissolved in aviation grade gasoline in the proportion of 1 pound of rubber to 2 gallons of gasoline. The binder is used in the ratio of 92 parts of sand to 8 parts of the binder. The sand must be free from moisture and contain the minimum amount of clay. Balata is dissolved in approximately the same proportions as for rubber except that benzol is the solvent. Thermoprene also is dissolved in benzol in the same proportion as rubber.

Stiffeners such as benzidine and para-amidophenol added to the binders give somewhat stronger cores. The stiffeners are dissolved in ether and added to the binder in the ratio of 0.25 per cent for each per cent of rubber present. In the mixture mentioned, the rubber content is about 7 per cent. Care must be taken in the core room to guard against ignition of the materials used. Any of the large rubber manufacturers undoubtedly will be able to supply milled, smoked sheet rubber, balata, or thermoprene cement.

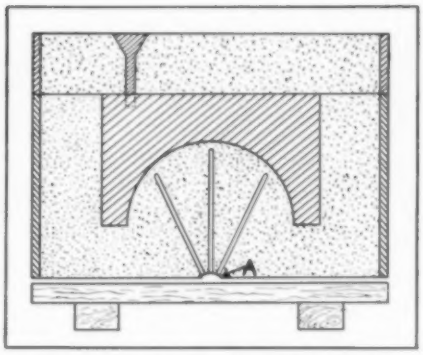
GRAY IRON

Bearing Is Defective

We are forwarding for your inspection a piece of a gray iron casting, apparently solid but which discloses several small cavities when machined on the inside. We have been unable to decide on the cause of this defect and will appreciate your opinion. The casting was poured from the iron of the following approximate analysis: Total carbon 3.46 per cent; graphitic carbon 3.05 per cent; combined carbon 0.41 per cent; silicon 2.56 per cent; sulphur 0.08 per cent; manganese 0.50 per cent; phosphorus 0.54 per cent.

The casting apparently is a bearing 9 x 9 inches with an opening for a 6-inch gudgeon or end shaft. The opening is partly closed with a shoulder at one end. The analysis of the iron is quite satisfactory for a casting of this kind, although a harder iron would wear longer. From the sharp clean lines on the outside it is apparent that the sand was rammed quite hard on the outside of the casting. Unfortunately, the inside surface has been machined and we have no opportunity of observing the original surface. However, basing our opinion on experience and on the character of the defective area exposed by the machine tool, we are fairly certain that the sand on the inside was rammed too hard, or was not vented properly.

If the sand is rammed by hand you can vary the density of the sand on the inside and the outside. The sand on the inside should be kept fairly soft. If the drag is formed on a squeeze machine the density of the



The Pocket Is Vented with a Wire

ramming may be adjusted by attaching pads to the surface of the squeezing head. If the mold is made on a jolt machine you probably will have to use a coarser grade of sand than at present and vent the pocket with a wire as shown in the accompanying illustration. After the bottom board is rubbed down, a channel is cut in the sand from end to end of the flask as shown at *A*. This will allow the gas and steam to escape freely. The casting submitted for examination showed that some of the steam from the raised body of sand became entrapped in the metal and caused the cavities. The gating system also is at fault. Instead of the one gate as shown, two gates should be provided, one opening into each of the pockets.

Q & A

Variation Is Small

We are making iron gate valves to withstand 150 pounds water pressure, and have been using a pig iron containing 2.50 per cent silicon; 0.029 per cent sulphur; 0.52 per cent phosphorus, and 0.80 per cent manganese. The furnace has discontinued making that particular pig iron, and recommends that we use an iron containing 2.60 per cent silicon; 0.035 per cent sulphur; 0.50 to 0.55 per cent phosphorus, and 0.65 to 0.85 per cent manganese. Will there be any difficulty encountered due to a change in pig irons?

As far as we can see, there hardly will be any noticeable effect in changing from one pig iron to the other, especially if both are supplied by the same maker. The slight difference in silicon content will not change your results to any extent, and if it appears to make your iron more open than you desire, increase the amount of lower silicon iron or scrap that you use in your mixture. While the difference in sulphur percentage of the two irons appears large, the difference will amount only to 0.003 to 0.005 per cent in the final iron. That is to say, if you now obtain iron which shows a sulphur content of 0.090 per cent, the new iron may show 0.093 or 0.095 per cent. However, when the new iron is substituted for the old, it is suggested that you watch your castings carefully to see that you obtain metal of the desired quality. If it varies from that desired, minor corrections in the charge such as increasing or decreasing the amount of lower silicon scrap will have the desired effect.

Q & A

Mold for Cast Iron Pot

We have been making cast iron pots bottom up in dry sand molds, that is molds made up of baked cores. The bottoms in these pots are rather unsatisfactory. We should like to cast these pots in the opposite position, that is with the bottoms down, but we have neither the equipment or knowledge necessary. The pots vary in size up to 4 feet deep and the sides usually are straight. What equipment and technique are required to cast these pots as they should be with the bottoms down?

Such a wide diversity of equipment and methods are employed in molding cast iron pots that no method or no particular piece of equipment can be singled out as the best. Local conditions decide that point. The size of the pot, the style of pattern, the skill or lack of skill among the workmen, the number of castings ordered, available equipment in the foundry, are among the principal factors to be taken into consideration. Rigging and methods quite appropriate for a 2-gallon pot would not serve for a pot with a capacity of several hundred gallons. Where the customer supplies the pattern, the foundryman has not the same free choice he has when he is in a position to make his own pattern equipment. A skilled molder can make a pot with equipment that would be of no earthly use to one less skilled. Machinery or other special equipment can be charged against a large number of castings, which would be prohibitive if only one or a limited number of castings were ordered. Where a spindle, sweeps and related equipment are available, the foundryman may sweep the molds to advantage. He may hesitate at installing this type of equipment where the orders are few and for small units.

Your present method of casting small pots bottom up is practiced quite extensively, particularly in hollow ware shops where all the castings are made in green sand molds. Where the molds are made properly the bottoms in these pots are quite solid and homogenous. Before abandoning your present method, which no doubt was inspired by some local condition, we suggest that greater care be taken in the free escape of gas from the cores forming the inside of the mold. If you have a back file of THE FOUNDRY, you will find illustrated articles on many variations of pot molding in the issues of: Nov. 1 and Nov. 15, 1921; April 1 and July 1, 1925; May 1, 1927 and July 15, 1929.

Problems in Nonferrous Founding

By Charles Vickers

Zinc Content Is High

We occasionally receive orders for nickel silver castings, and have been using an alloy of 50 per cent copper; 30 per cent zinc; 20 per cent nickel; but when the castings are polished numerous pit holes develop. We do not understand why this is, whether it is due to the alloy, or to the sand we are using. We are casting in green sand, using grade No. 00. Do you think we would have better results using French sand, and do you believe it necessary to dry the molds? We melt in a gas-fired crucible furnace, and the melting time is approximately 1 hour, using charcoal and borax as a cover. Probably we would have better results if the zinc content was about 14 per cent. We would like to learn whether or not high zinc is essential to making nickel silver castings.

The gas-fired crucible furnace and the time it takes to get out a heat of metal are satisfactory. The covering of charcoal and borax is also good considering the melting time and the type of furnace, and if all other factors were equal to these no trouble would be experienced with pin holes in the castings. The sand is too fine for such an alloy, and it is only suitable for small castings of aluminum, and such brasswork as chandeliers and electroliers and small name plates. For the nickel silver use a No. 1, Albany grades. We do not believe that French sand will be satisfactory. Use a more open grade of sand for the work.

The metal mixture mentioned is one of the rolling mill alloys, and is not at all suitable for the sand foundry. The logical thing is to add nickel to red brass and whiten it to a nickel silver, and use that instead of trying to cast a nickelized yellow brass. Select an alloy of red brass and replace a portion of copper by nickel for making your nickel silver. It does not matter what alloy is selected, so long as it is an easily cast mixture, but it is not necessary to use ounce metal, because 3 per cent tin will be high enough. The zinc should be under 10 per cent. It can be compensated to some extent by lead. Zinc will give the nickel silver a yellowish and dirty cast when it is polished. Lead will give a tinge of rosiness, much more pleasing. Tin of course stiffens it. A little phosphor copper is a good addition if deoxidizing is required, and about 1½ ounces to 100 pounds of metal, will give good results.

Q & A

Casting in Metal Molds

We would appreciate any data on casting aluminum bronze in metal molds.

Aluminum bronze die castings are generally small and expensive. Their cost usually is more than a sand made casting. Dies must be accurate and must be operated by machines to rapidly close them for pouring and open them for the ejection of the castings. Dies work on the same principle as a sand mold that is poured upright. The metal is poured down a sprue and fills the mold by gravity. The mold has to be vented to avoid air pressures in any part of the mold that would stop the progress of the metal when filling the mold. As there may be variations in the section of the castings, it may be necessary to water cool certain parts of a die to adjust solidification of the metal so that the casting will congeal uniformly, thus avoiding cracking, and internal strains. Also, as many cored castings are produced by steel cores, it usually is necessary to design those parts so that the cores are ejected before the mold itself is opened. As experimentation is costly, it will repay you to obtain the services of workers skilled in the art.

The bronze is melted in small crucibles. It also can be melted in furnaces of the muffle type, that will hold a number of small crucibles, of size no larger than a No. 18. The alloy mostly used is the straight copper 90 per cent; aluminum 10 per cent. This alloy has to be entered into the mold at its lowest point to avoid agitation, which forms dross. As it may be a matter of experiment to find the best way of gating a particular casting, it is an economy in this case to first make a tentative mold of graphitic carbon, and operate it in the die machine, before starting on the regular die. Graphitic carbon is cut easily. Gates, wrongly placed, can be plugged, to permit a new gate elsewhere, and other changes may be made until satisfactory results are attained. It is not necessary, in this preliminary mold to approach the accuracy of the die.

Aluminum bronze is not a well behaved alloy from the casting standpoint, and die castings made from it usually do not require the strength of such an alloy. Silicon bronze is a much better alloy to die cast, and in strength is not greatly below aluminum bronze.

Q & A

Silica Sand Is Used

One of our casting customers requested us to learn the name of a finely crushed rock that is used in making molds and facings for nickel and nickel alloy castings. It is said that the material withstands heat better than ordinary molding sands and permits the free escape of gases.

Undoubtedly your inquirer has reference to silica sand which is used regularly in steel foundries for molding purposes. The silica rock for that purpose is quarried and crushed to the desired fineness. It may be obtained from several firms whose names can be found in the advertising section of THE FOUNDRY. Silica sand contains no binder and that constituent must be added as claywater made from a good quality of clay, or one of the numerous bonding clays which are sold under trade names.

The following molding sand mixtures have been used successfully for molding nickel and monel metal: Light castings up to 4 pounds—1 part No. 1 Albany, 1 part Jersey and 3 part old sand; moisten with water or claywater. Castings from 5 to 20 pounds—2 parts old sand, and 1 part No. 1 Albany. Heavy castings—1 wheelbarrow Millville gravel, 1 wheelbarrow old sand, 1 wheelbarrow Lumberton, and 1 shovelful flour; add water or claywater for proper moisture.

Molds for medium and heavy castings are dried before use. Before drying the mold faces are sprayed with a mixture of equal parts of water and linseed oil, and then are coated with a mixture of equal parts of graphite (plumbago) and clay.

Fig. 1—S. S. California Passing Through the Canal on Her Maiden Voyage

Makes Marine Castings in

By C. A. McIlvaine

PANAMA CANAL FOUNDRY

THE foundries at the Balboa shops are an essential part of the extensive repair shops operated by the mechanical division of the Panama canal. The steel and iron foundry and the foundry for nonferrous metals are housed in one building. The shops and dry dock at Balboa are adjacent to the inner harbor, on the east side of the canal. Here are located oil and coal bunkering stations, dry docks and shops, and commercial wharves and docks. The mechanical division shops and dry dock are in a central location, conveniently accessible from the water and the mainland.

Shops originally were established at Balboa to maintain marine equipment during the construction of the Panama canal. With the opening of the canal to commerce in 1914, they were reconstructed and expanded both for the original purpose and to supply repairs to seagoing vessels in a section of the world where facilities for such work otherwise are in-

Fig. 2—General View of the Mechanical Division, Panama Canal, at Balboa, C. Z. The Dry Dock Is in the Foreground and the Foundry Is Beyond the End of the Dock

Fig. 3—Interior View of the Foundry at Night. The Shop Is Well Illuminated

adequate. All kinds of repairs are made, from those of fine navigating instruments, calculating machines, electrical equipment, etc., to the heaviest work on shafts, propellers, or hulls of vessels, and on railroad locomotives and cars. The dry dock is 1000 feet long, 110 feet wide, and 35 feet deep over the blocks at mean tide and is capable of handling the largest ships in existence. The shops and dry dock together are of importance to the navy. A considerable amount of routine maintenance work is performed for the navy at the canal shops, both at Balboa and Cristobal. In time of need, the Balboa shops would be an important repair station.

The foundry at Balboa is equipped with a 2-ton tropenas converter; one 10-ton, one 7-ton, and one 1-ton cupola; and the usual brass furnaces. The foundry is equipped with an efficient sand-blast system for cleaning castings, gate saws, sprue cutters, welding and cutting equipment, annealing furnaces, core ovens, mold drying ovens, etc. The foundry can produce castings of the following sizes: Bronze, brass or composition, ¼ pound to 1000 pounds, iron ¼ pound to 26,000 pounds; and steel, ¼ pound to 10,000 pounds. The pattern shop, equipped to handle any and all classes of pattern work, also is maintained with the foundry. The total floor area of the foundries and pattern shops is approximately 37,750 square feet.

During the fiscal year ending June 30, 1930, the output of the foundries was 3338 steel castings, weighing 566,645 pounds; 5063 iron castings, of 472,811 pounds; and 8645 nonferrous castings, weighing 128,457 pounds. The total was 17,046 castings, with an aggregate weight of 1,167,913 pounds. A great variety of work is done. The Panama railroad and various ships coming to the canal shops require a wide range of foundry work, and in addition, a number of special orders are completed for firms in Panama or adjacent countries not equipped with foundries adequate to emergency needs.

The accompanying illustrations present a general view of the shops and dry dock, and the relation of the foundry to the other parts of the plant; an exterior view of the foundry building; and an interior view. The shops are equipped to work night and day when occasion demands, and a considerable amount of rush work is done to prevent delay to ships.

A.F.A. Directors Elected

(*Concluded from Page* 84)

pal Engineering, Indianapolis, for a time and then became publication supervisor, engineering experiment station, University of Illinois. From 1912 to 1917 Mr. Avey was assistant cashier, Central Illinois Trust & Savings Bank, Mattoon, Ill., and in 1918 became associate editor of *Iron Trade Review*, now the publication *Steel*. In 1919 he was made managing editor of THE FOUNDRY, and since 1926 has been editor. He participated actively in the formation of the Gray Iron institute serving as organizing secretary from its inception until formal organization in the summer of 1928. Mr. Avey also has been active in committee work of the American Foundrymen's association and at present is chairman of both the papers committee and of the committee on international relations. In addition to being a member of the American Foundrymen's association, he is a member of the American Society for Testing Materials, and the International Association for Testing Materials.

Agree on Trade Customs

In recent months, the merchandising committee of the Gray Iron institute, Terminal Tower building, Cleveland, has been working with the iron and steel committee of the National Association of Purchasing Agents to secure the adoption and approval of the standard sales agreement and trade customs of the institute which were published in the July 1, 1929 issue of THE FOUNDRY. An agreement has been reached and the agreement and customs have been approved by the iron and steel committee and the executive committee of the National Association of Purchasing Agents.

Discuss Light Metals

More than 50 papers will be presented during the convention of the Deutschen Bunsen Gesellschaft fuer Angewandte Physikalische Chemie which will be held in Vienna from May 25 to 28. Part of the sessions will be devoted to a symposium on progress in metallurgy and its application to light metals. About 15 of the papers to be presented will deal with the metallurgy of aluminum and magnesium.

Northern Engineering Works, 210 Chene street, Detroit, has opened an office in the Fidelity building, 1940 East Sixth street, Cleveland.

Fig. 4—Exterior View of the Foundry Showing the Flask Storage Yard

DAN M. AVEY
Editor

The Shakeout

FRANK G. STEINEBACH
Managing Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

CHARLES VICKERS
Nonferrous Editor

NORMAN F. HINDLE
Assistant Editor

¶ Honors to Donors

SINCE their establishment in 1920 by generous gift of four notable men identified with the foundry industry, the medal awards of the American Foundrymen's association have served to distinguish and reward outstanding service to the industry. The names of the twelve men who have received this recognition, nine American, two English and one French, are familiar and honored throughout the foundry world.

IN SELECTING Ralph Stewart MacPherran as the recipient of the medal this year, the board of awards honored a man whose work and personality have reflected great credit to the entire foundry industry. Quiet, modest and unassuming and with a thoroughly practical viewpoint upon scientific matters, Mr. MacPherran is known throughout the world for his contributions to the metallurgy of gray iron. Furthermore, his intimate contact with engineering societies and particularly the American Society for Testing Materials has been of great benefit to the entire foundry industry. The association honors itself in recognizing the worth of the service of this man.

¶ Strength in Associations

WHILE business is on the up and up, little thought apparently is given to legitimate expenses incurred in conducting an industrial concern. However, at the first signs of a slacking up in demand, there is a concerted whetting of pruning knives by industrial executives that is heard far and wide, and the merry task of lopping off alleged unnecessary expenses is underway. Usually, there is a difference of opinion between executives and department heads as to what constitute *unnecessary* expenses, and in many instances valuable work is badly crippled by the careless wielding of the knife.

IN PERIODS of business distress wits are sharpened, and often new and previously unthought of uses are developed for manufactured products by those who possess the happy faculty of being able to visualize applications of their products in new ways. Usually men of such caliber are interested in the broad aspects of their industries, and are willing to co-operate with others in maintaining high standards of business practice. Naturally, the question arises —"Where can WE meet such men, discuss our problems with them, or hear their experiences?" The answer is—Join your trade association if you do not belong, and if you are a member, attend every meeting, carefully digest all reports and literature sent out, and be active in the association. Above all, do not be penny wise and pound foolish in allowing membership in an active trade group to lapse.

A STATEMENT made over the radio recently by Dr. Julius Klein, assistant secretary of commerce, emphasizes the value of maintaining group affiliations. He says, "I hear some members of business bodies talking these days, about the possibility of resigning from the organization, with the object mainly of supposedly saving money. I can think of nothing more dangerously extravagant than that—a wasteful squandering of that invaluable asset of good teamwork at the very time when collaboration is absolutely vital. When you are out in mid-Atlantic in a bad storm, do you see anybody shoving off from the big liner in a rowboat by himself to save passage-money? Well, hardly."

¶ Cutting the Corners

FEW business or manufacturing institutions are neglecting any opportunities to effect economies these days. The word has gone down the line all the way from the management to the window washing crew to reduce expenses and conserve all items. Excellent move, this return to the old fashioned ways of thrift and saving, when intelligently applied.

A LARGE electrical manufacturing company is plotting curves and showing "before and after taking" examples of savings which have been effected through reducing sections, cutting down machine allowances, redesigning, and other types of economies that in the aggregate will save thousands of dollars. This is sound business. Such savings are of permanent benefit. However, intelligent direction is particularly necessary in work of this character. Cheese paring and candle shaving tactics which cannot discern the difference between the essential and nonessential should not be permitted to rule.

Steel Founders Collect Data on Design

Information for Engineering Students Approved and Material for Hand Book Is Under Way—Meet in June at French Lick

RECENT activities of the Steel Founders' Society of America, Inc. were reviewed and additional consideration given to pending matters at the regular meeting held in Pittsburgh April 22-24. Nearly 100 attended the three-day session. The first day was devoted to meetings of special subcommittees of the society, while the general session was held April 23.

The special group on recommendations to designers, of which Ray S. Munson, Atlantic Steel Casting Co., Chester, Pa., is chairman, approved a final draft of the brochure explaining the fundamentals of steel casting design for engineering students of technical schools. This draft will be transmitted to the joint committee on foundry education in engineering schools, which is sponsored by the A. F. A. The technical research committee, headed by W. H. Stiemke, George H. Smith Steel Casting Co., Milwaukee, considered the drafting of new specifications covering carbon steel castings. A special committee on the steel casting handbook started work laying out the structure of the book and discussed the assignment of subjects and the collection of material.

The general session was presided over by W. W. Powell, Mesta Machine Co., Pittsburgh. Granville P. Rogers, managing director of the society, reported briefly on a few of the activities of the organization since its last meeting on March 20. Among others this included a report on the compilation of specifications for manhole frames and covers. Investigations of the comparative value of cast and forged steel for railroad car center plates have been conducted and the data presented to members of the society. Survey work included a tabulation of gas rates and costs for steel foundries in various sections of the country and a survey of tax data and financial information for the use of members. Mr. Rogers stated that the society has continued its activities in preventing unwarranted expansion of foundry capacity through the establishment of new foundries. It also has taken issue with unethical advertising discriminating against employment of steel castings.

It was announced that the midsummer convention and the last meeting of the society until early fall will be held at French Lick Springs hotel, French Lick, Ind., June 16-18. Separate meetings of both the large and small castings divisions will be devoted to a preparation and study of the uniform accounting and cost plan of the society and a report on what its department has done to date and the service it now is prepared to render members. The first meeting of the engineering and metallurgical division of the society also will be held at that time. Tentatively, that will consist of the election of a permanent chairman of the division and of a program committee. The session will open with the discussion of a definite new use for cast steel applying largely to the open-hearth division of the industry. Another discussion will be on new uses for cast steel applying to the small castings division. One paper to be presented will be, "The Cause and Cure for Hot Cracking." An exhibition also will be conducted, displaying some of the work and accomplishments of the society.

A discussion of the survey on welding vs. steel castings, presented by by Mr. Rogers, covered the activities of the society over the past several years in attempting to eliminate publicity on the part of manufacturers of welded products and welding equipment that is considered unfair to the steel castings industry. Mr. Rogers reported that co-operation has been obtained between the society and manufacturers of welding equipment in alleviating this condition, and the belief was expressed that through the continued efforts of the society what was an attack on the industry and its products might be turned into the development of new markets for many products made of cast steel and utilizing the welding process.

Results of a questionnaire sent to various steel foundries of the country indicated that 12 per cent consider welding a serious competitor while 88 per cent do not. Of the total, 23 per cent believe that welding may or will become serious competition while 77 per cent do not. The large majority believe welding will enjoy a normal growth and will have legitimate field of application while 25 per cent are of the opposite opinion. It was reported that in a number of instances business in cast steel has been lost to welding but on other occasions business has been regained after its manufacture by use of welding had proved unsatisfactory. It was pointed out that some of the inherent weaknesses of welding are: The variance in yield point to welds; impossibility of heat treating welds in some instances; lack of graceful lines in certain designs; low resistance to vibration, torsion and alternating stresses; and difficulty of detecting imperfect welds.

The general session was addressed also by J. W. Howell, assistant professor of economics, Carnegie Institute of Technology, Pittsburgh, who spoke on the subject, "Business Stability Under a Falling Price Level."

It was reported by members at the latter gathering that despite a moderate increase in operations and bookings of steel foundries the outlook remains unfavorable. A number of representatives indicated a slight increase in production since a month ago, averaging possibly 15 per cent with a similar upturn in bookings.

About half of the members of the society announced operating rates of less than 50 per cent while only 15 per cent of the number are scheduled at better than 70 per cent. Builders of heavy steel mill machinery continue to report the best operations. Foundries serving the railroads are running at a slow rate. A fair gain was reported by companies dealing with the machine tool industry.

Separate meetings were held of the large and small castings division. At the latter Ralph West, West Steel Casting Co., Cleveland, was elected chairman of the program committee for the Central Atlantic division. The merchandising and membership committees met later in the afternoon. A meeting Friday morning of the heat-corrosion resistant alloy founders' division concluded the session.

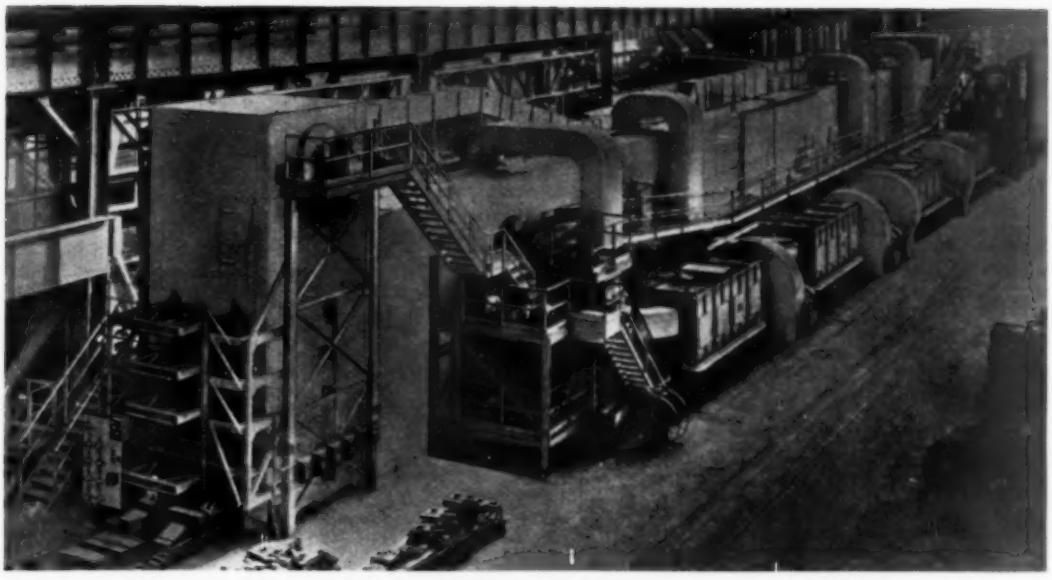


Fig. 1—The Five Tier Continuous Oven Is Heated by Four Independent Oil Burning Units Each Served by Two Oil Burners Regulated by Automatic Controlling Devices

Foundry Installs Large Ovens

WHAT is claimed to be the largest core oven in the world, an oven of the roller conveyor type, recently was designed and built by the Foundry Equipment Co., Cleveland, for the General Steel Castings Corp. It is now in operation in the large new foundry erected by the corporation at Eddystone, Pa., on the outskirts of Philadelphia, where the company is making steel castings for the railroad and other industries.

This oven is approximately 235 feet in length and is equipped with specially designed roller conveyors designed to withstand high temperatures. The rollers are mounted in nitrided bearings and particular care was taken to align the rollers accurately in a straight line. The design of the system is based upon continuous support of the thin core plates. The operating temperature is approximately 500 degrees Fahr. In the roller conveyor type oven the core plates are loaded directly on roller conveyors which extend from end to end of the oven. The core plates are moved through the oven either by live rollers located closely together and offering a continuous support or by a pusher mechanism which operates directly on the plates. The core baking time is regulated by the speed of conveyors.

This type of oven is particularly adaptable to large or heavy work and offers the unique advantage that notwithstanding the size and weight of the cores, comparatively light, thin core plates can be used. This feature is made possible because lifting the cores is entirely eliminated. The cores and core plates are rolled over directly on to the rollers which provide practically a continuous support under the plate.

It is customary in some classes of heavy cores to use a ratio of from 3 to 6 pounds of iron core plate to one pound of core sand. It is possible with this system to run the ratio down to one-half pound weight of plate to one pound of sand, a reduction of approximately 90 per cent. The tremendous saving in capital investment in core plate weight and the economy in fuel readily is apparent.

The oven contains five tiers or continuous chambers, each one operated independently of the others for the accommodation of various classes of cores. The baking time for the various tiers ranges from 1½ hours to 12 hours and the traveling speed of the conveyors is regulated accordingly. Variable speed arrangements permit change in baking time for the cores handled on any of the tiers. The cores pass first through a preheating zone, then through a baking zone and finally through a cooling zone. The oven is heated by four sets of heaters located on the outside. Each set has four units served by two oil burners. One is regulated by an automatic controlling device, varying the temperature, while the other operates at

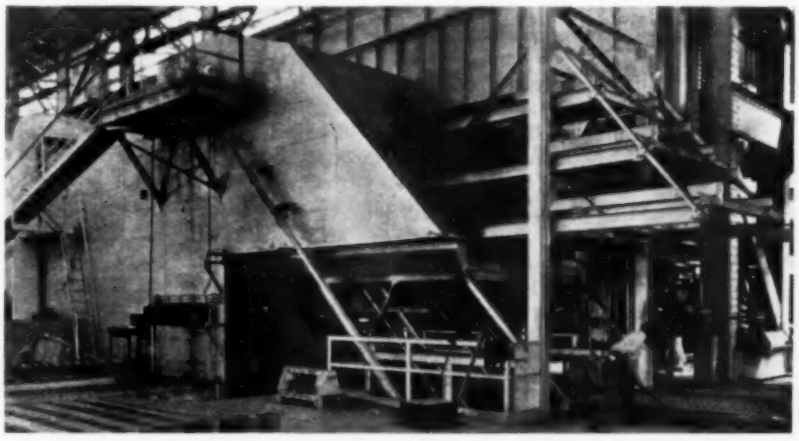


Fig. 2—Cores for the Three Higher Tiers Are Raised on an Inclined Elevator. The Two Lower Tiers Are Served by a Vertical Hoist

a constant flow. Hot gases from the heater are delivered to the oven by extra heavy duty fans, equipped with water jacketed bearings. All of the outside heating system, fans, ducts, etc., are insulated heavily. The entire heating system is under automatic control and provision is made for regulating the amount of heat delivered to various parts of the oven.

Roller conveyors carry the cores from the coremaking stations to the entrance of the oven where they are lifted on elevators and pushed on to the rollers in the proper tier. Cores destined for the three higher tiers are raised on an inclined elevator. The two lower tiers are served by a vertically operated pneumatic hoist-in arrangement. An automatic locking device insures perfect alignment for the core plates as they pass from the elevator to the oven rollers at any level.

In the oven the cores and plates are propelled toward the opposite end by a pusher mechanism. At the unloading end the cores are received on an elevator which lowers them to the floor level of a roller conveyor line from which they are lifted. inspected and distributed to various points in the foundry.

Hot gases from the combustion chambers pass to a diffusing chamber where they are mixed with cooler gases drawn from the oven. In this way recirculation is secured with a consequent saving in fuel. It is claimed that with this system, core breakage practically is eliminated and waste oven volume is reduced to a minimum.

An exceptionally large mold drying oven 70 feet in length, 18 feet wide and 11 feet 6 inches high also was designed and installed by the Foundry Equipment Co., Cleveland. The oven is provided with a door at each end so that green molds may enter at one end and be taken out at the other end.

Insulated brick walls and unique design of roof construction insure minimum heat loss. A motor attachment lifts and lowers each door and a safety catch is provided to automatically lock the door at any stage in the event a cable should slip or break. The entire oil heating system is located above the oven where it is supported on a framework independent of the oven structure. Heavy cast steel car bodies traveling on a double track convey the molds into and out of the oven

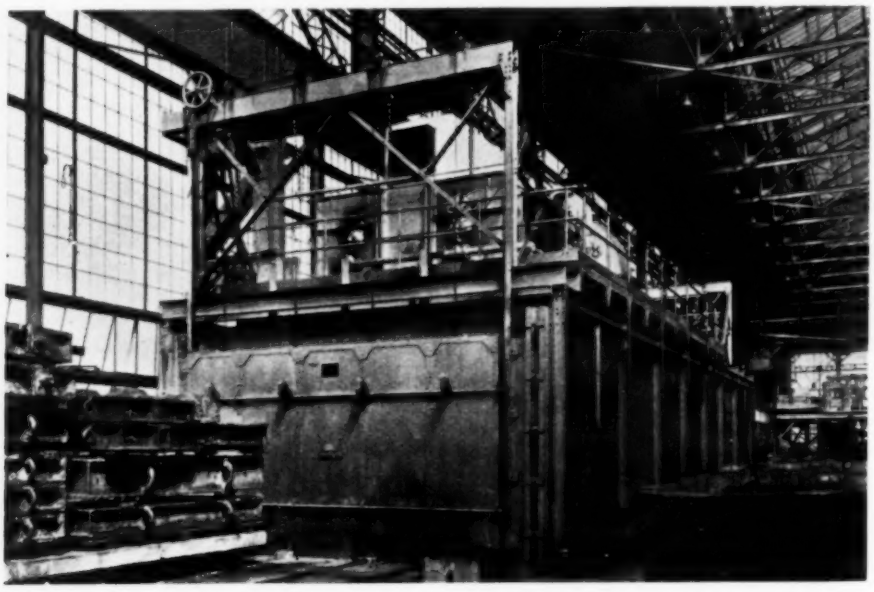


Fig. 3—The Oil Heating System of This Large Mold Oven 11 Feet 6 Inches x 18 x 70 Feet Is Located Above the Oven on an Independent Framework

Will Meet in Zurich

Switzerland will be the scene of this year's autumn meeting of the British Institute of Metals. It is being held in Zurich from Sept. 13 to 18 by invitation of the Schweizerische Verband fur Materialprufung. The evening of Sept. 13 will be devoted to the formal opening of the meeting, addresses of welcome by the inviting body, and the autumn lecture. The latter is to be given by U. R. Evans on "Thin Films on Metals in Relation to Corrosion Problems." After the lecture an entertainment will be given in the Great Hall of the Zurich Polytechnic.

The mornings of Sept. 14 and 15 will be devoted to the reading and discussion of papers. In the afternoons visits have been arranged provisionally to the works of Escher, Wyss & Co., Zurich; Maschinenfabrik Oerlikon, Oerlikon; Brown, Boverei & Co., Baden; Sulzer Brothers, Winterthur; Kraftwerke Waggital, Waggital; Eisen & Stahlwerke vorm. G. Fischer, Schaffhausen, and Alfred J. Amsler & Co., Schaffhausen.

Department Will Act in Consulting Capacity

Steel Founder's Society of America recently has established a development engineering department in its headquarters at 932 Graybar building, 420 Lexington avenue, New York. The principal function of the department will be the development of new uses and applications of cast steel and to serve all industry in a consulting capacity on the use of steel castings. The service is offered free to mechanical engineers, machine and equipment designers, and to others responsible for the specification of materials.

Advice will be offered on such problems as the proper proportioning of metal sections to secure the best casting results, best types of cast steels available to satisfy desired physical specifications, and redesign of cast steel members with which trouble has been experienced either in production or service. Assistance also will be given in locating foundries capable of handling individual requirements and authoritative information will be supplied on the relative merits of cast steel in meeting specific service requirements. Another activity of the new department will be the conducting of informal discussions with small groups of designers and others interested in obtaining better working knowledge of the products of the steel foundry.

J. J. Baum, formerly connected with the Ohio Steel Foundry Co., Springfield, O., is in charge of the new department.

A. S. A. Will Standardize Manhole Parts

American Standards association, 29 West Thirty-ninth street, New York, has undertaken a project which involves the standardization of design, material, and dimensions of manhole frames and covers. The sponsors of the project will be the A. S. A. Telephone group and the American Society of Civil Engineers. A sectional committee, under the chairmanship of L. B. Fish, American Telephone & Telegraph Co., New York, has been organized and divided into subcommittees on sewer, water, gas, steam and air; electric light and power; electric and steam railways; communication systems; specifications and inspection; and a correlating committee.

Thomas W. Pangborn, president, Pangborn Corp., Hagerstown, Md., recently was elected a director of the Equitable Trust Co., Baltimore. Mr. Pangborn also serves on the directorate of the Maryland-Virginia Joint Stock Land Bank, Baltimore and the Hagerstown Bank & Trust Co., Hagerstown, Md.

BILL

By Pat Dwyer

Hears of an Old Blast Furnace

ACCORDING to his usual last minute custom, Bill dashed into the LaSalle Street station about two minutes before our train pulled out for home the night after the American Foundrymens convention closed. He bounced up the steps like one of these chamois you see pictured, gamboling among the peaks and glaciers of the high Alps. Arrived at the top of the steps he streaked across the upper waiting room—I trust the reader realizes I am referring to Bill and not the chamois—through the gates after favoring the guardian with a momentary flash of his ticket, and then grabbed the hand rail of the last car in the wake of the porter who was carrying his—the porter's—little foot stool aboard. The dignified colored gentleman coldly informed Bill that the caw he wanted, Suh, was fohwa'd Suh, about tain caws. He also cautioned him to proceed through the cars cautiously. Many of the passengers had retired to their little nests.

Bill plowed ahead bravely until finally he found the space reserved for his benefit. He threw his hat, coat and bag in the berth and then came into the smoking compartment to—as he said—rest his feet, hands and face and have a draft of the weed before he rolled himself into the arms of Morpheus for the night. He said he had been puffing cigars and cigarets for a week and now he was going to have a smoke.

To my remonstrance that some day he was going to cut the time too fine, hang on a few seconds beyond the last minute and thereby miss his train, he replied flippantly that he never had missed one yet. No. not even in the old days when he had to sneak up on 'em from behind the water tower and ketch 'em on the run!

"Anyway" he remarked "I made it, didn't I? I am just as safely and solidly on board this jolly old rattler as you are. I suppose you have been vegetating here or hereabouts on one of the hard, hard benches in the waiting room for an hour, hey?"

He stretched his long legs comfortably, filled and lighted a disreputable corncob pipe, sighed contentedly and remarked that he had had a perfectly gorgeous week's rest. The old batteries were fully recharged and he looked forward with zest and eagerness, yea with positive pleasure to the prospect of bucking the line for another year.

Foundry Term: A Long Crooked Runner

"Nothing like a bit of a change" he pointed out oracularly "to blow the cobwebs out of the belfry, any belfry. It is surprising all the pointers a fellow can pick up circulating hither and yon among the gang.

"All the boys come there, the smart young fellows and the wise old ones, loaded down with the result of the year's research and investigation and just dying—as the saying goes—to spill it. A man must be a dummy or a hermit if he can't collect enough information to pay for the trip.

"In addition to what you might describe as the direct product, the immediately usable material, a great deal of miscellaneous material, which might be classified as byproducts, is lying around loose, just waiting to be picked up by any smart little picker.

"At one of the shop operation courses — Tuesday or Wednesday — I forget which—no difference anyway—I sat next to a lad from Philadelphia whose hobby for many years has been an investigation of early iron making history in the vicinity of his native city and in many other sections of the sovereign state of Pennsylvania. He extended a cordial invitation to visit him and view his collection of relics and specimens if I go to Philadelphia.

"He did not say so in so many words, but in a general way I gathered the impression that he is a descendant of one of the old iron masters, one of the tribe of able men who laid the foundation of an iron state. Who hewed for themselves places in the forest and set up plants for the extraction of iron from the ore that had lain there undisturbed probably since the creation of the world. Pride in their descent from these men is not confined to the male members of the family. The flame of patriotism and allegiance to an honored name blazes as brilliantly—and at times as fiercely—in the hearts of the women whose grandfathers or great grandfathers conquered the wilderness and founded the family fortunes on a solid foundation of iron. The financial return from one of these plants was considerable as reckoned by the standards of the day and age, but I think that the men who set up the first furnaces and forges were animated as much by the spirit of adventure as they were by the thought of future financial gain.

"They were the first white men to penetrate the wilderness, to follow the dim trail left by the pioneer hunter whose only passport to an inland empire was sublime courage and confidence in his ability to make his own way—supplemented, perhaps by a good eye, a steady hand and a long rifle that could be depended upon to throw a slug where a slug was best calculated to advance the rifleman's fortune.

"They—the iron men—had to pit their strength, ingenuity and courage against the forces of nature. They had to set up self governing communities far from their source of ordinary supplies and far from their markets. They had to gamble with freshets that washed away the work of their hands and with droughts which caused them to cease operation. They had to contend with possible exhaustion of the ore beds and the timber designed for conversion into charcoal. They had to take chances on the variation in market quotations on pig iron, blooms and bars, on orders in council emanating from England in the days before the revolution and on asinine tariff regulations adopted by their own govern-

ment in succeeding and later years.

"It seems curious to look back now and reflect that these men used charcoal exclusively for smelting the ore and afterward in forging the iron. Curious in view of later discoveries that showed immense deposits of coal, both anthracite and bituminous, lying in the ground and waiting for extraction. The Pennsylvania of today, largely is what it is, through utilization of these coal deposits, and yet 100 years ago people were worrying because the hungry blast furnaces were devouring the forests in the shape of charcoal. They wondered how iron was going to be made after the forests became exhausted and burned out.

Another Reason Why the Wild Waves Are Wild

"All of which just goes to show that the habit of worrying is neither new nor original nor confined to any particular period or to any particular race of people.

"Do you remember all the excitement a few years ago when some one discovered that the level of the waters in the Great Lakes had dropped about a foot? Immediately a great hue and cry was raised by ship owners and others whose interests are identified closely with a definite depth of water in the channels and in the vicinity of the various docks. Attempt was made to show that the city of Chicago was diverting such a volume of water into its drainage canal, that the level of all the chain of lakes was lowered to an appreciable and dangerous extent. I believe, Lake Superior was exempt.

"Commissions were appointed and lawyers were hired—beg pardon, retained—to attack and defend the city. These experienced lads can fight just as well and as enthusiastically on one side as on another. No matter which side wins, they get their's. And how!

"Statisticians presented reams of figures showing (a) Normal depth of water in each of the lakes, before and since the passing of the 18th amendment (b) depth at the Soo in the panic of '97; in the Detroit river when Cadillac landed, in the Niagara before and after the fall and in the St. Lawrence before the ice bridge moves out in the spring (c) volume of water in the drainage canal in the spring, summer, fall and winter of Big Bill's first dynasty (d) amount of water supplied the lakes by natural drainage, water sheds, umbrellas, etc., and amount supplied by springs of all kinds including the spring of the year '98.

"In the midst of all the fighting and squabbling and with the canal running wide open, free and handsome, the water in the lakes began to rise. Last summer the level was 2 feet above what it was when the canal was opened. Where all this extra water came from, no one appears to know, but there it is, as you can see for yourself any time you have occasion to saunter down to the Ninth street dock to board a boat for Detroit or Buffalo. The gangway from the dock to the boat slants upward instead of downward as it did a few years ago. Perhaps you have noticed—"

"I have noticed" I said "that you have wandered a long way from the fairway. You have deserted the open glade in the primeval forest made by the wood cutters and now are lost in a water hazard. I wish you would stick to the blast furnaces. Did this friend of yours, this gallant lad from Philadelphia in the morning, did he, by any chance, mention or describe what kind of a blowing rig was employed on these early furnaces?" "He did just the very little thing, and he did it by the simple expedient of giving me a clipping from an eastern newspaper. Here, take a look once at it—as they say in Pennsylvania—and you will learn many things about the beginning of the blast furnace industry in America.

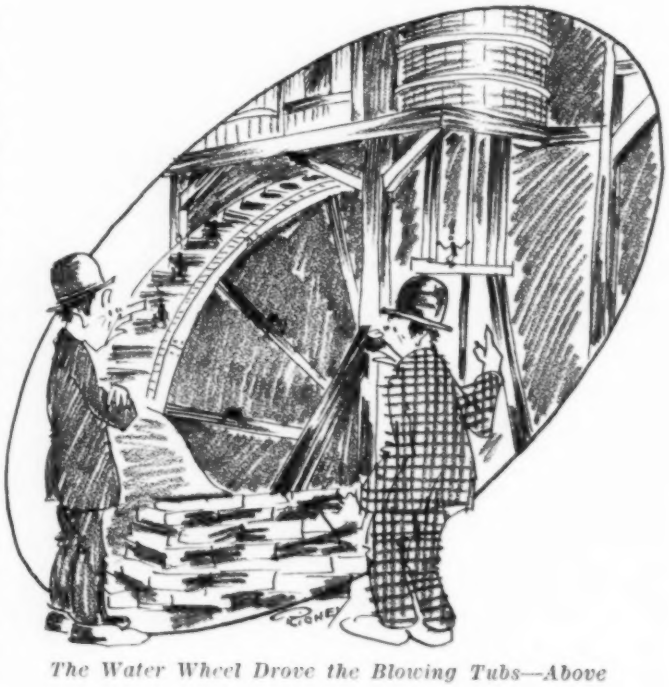
The clipping bore the impressive head: FRANKLIN INSTITUTE SECURES RARE BERKS COUNTY RELIC, with a bank or sub head in smaller type Wooden Blast Machine from Hopewell Furnace To Be Set Up in Museum in Philadelphia.

From the ordinary newspaper view point, the view point which recognizes and caters to the hurryup or head line reader, the entire story was contained in these few lines. However, for the benefit of the more leisurely reader, the reader with the time and the curiosity to delve deeper, more complete detail was supplied as follows:

Through the favor and generosity of Mrs. Edward Brooke of Birdsboro and the vision of the officials of the Franklin institute, the ancient wooden blast engine at Hopewell furnace, Union township, is to be taken down and re-erected in the new hall of the Franklin institute on the Parkway in Philadelphia, when the projected museum is built.

The machine consists of a large bucket water wheel attached to a crank on each side of which are vertical piston rods which extend up to and operate a piston in each of the wooden tubs. Between the tubs is a wooden chamber or air receiver from which the main blast pipe, in former days, conducted air under pressure to the tuyeres or nozzles at the base of the furnace.

There were no facilities in that day for constructing large machines of iron or steel, therefore wood was employed. The cost was not great, but considerable ingenuity was required. The chief aim was to produce a uniform air pressure. Upon it depended the constant degree of high heat generated by burning charcoal.



The Water Wheel Drove the Blowing Tubs—Above

The construction of the wooden cylinders was a delicate operation. They were usually segments of wooden circles glued together. The thick-

ness of the sides was about 3 inches and the interior perfectly round and smooth, coated with plumbago for the sliding of the circular pistons inside. Such a machine readily furnished from 1000 to 1200 cubic feet of air per minute under a pressure of about ¾ to 1 pound per square inch. It made about 15 to 16 strokes per minute with normal revolutions of the water wheel.

"Here's another clipping which throws an interesting sidelight on living and other conditions which prevailed in the community which depended on the blast furnace for a living. It is taken from the books of the company and is a summary of the years operation."

I don't know where the printer in his wisdom will see fit to insert this table, but if you search around, you will find it stuck in some place.

"The gross profit runs into a pretty handsome sum and should leave a fair margin over a period of years after deducting all other expenses. At a time when large fortunes were the exception rather than the rule, these iron masters lived in baronial style, benevolent autocrats in their own districts. As with Robinson Crusoe, they were monarchs of all they surveyed. They represented Authority with a capital *A*, the court of last resort, they dispensed the high justice the middle and the low.

"The system may be open to question under present day conditions but no one will deny it was the ideal form of management in small and isolated communities where the entire population depended for a living on the manner in which the boss conducted his business. If he grabbed off the lion's share of the profit he was entitled to it. If you were in his place—"

"Why bring that up? I do not think any person can tell in advance how he will act under greatly changed conditions. Also it is idle to speculate on how one man would conduct himself, if placed in another man's position. To some men, absolute power is more intoxicating than money or liquor—"

"Well," Bill interrupted with a grin, "I guess there wasn't much intoxication around any of the old blast furnaces where the base wage appeared to be $100 per year. The only lad who appeared to draw down the big money was the *experienced founder* whose stipend is set down as $900. I suppose founders were exceedingly scarce in those days and as a result their services commanded a handsome premium.

"The real aristocrats among the tradesmen in the early days, men whose supremacy and prestige continued up to the seventies and eighties of the past century, were the millwrights. Each of these men was a combination carpenter, blacksmith, engineer and machinist and also could turn his hand to stone cutting, masonery and brick laying. He not only was competent to design and install all the mechanical equipment in a plant, but usually he built all the parts with his own big red hands.

"Take that blast furnace for example with the big wooden water wheel and the wooden blowing tubs all fabricated by hand. The millwright on that job might just as well have built the tubs square, but in the pride of his skill he built them circular, turned accurately on the inside, and probaly on the outside. That would be a nice job even for today with all modern equipment—"

"Who ever heard of square blowing tubs? You are letting your imagination run away with you. Why—"

"My dear lad a few years ago an old gentleman sent me a description of a small foundry within 50 miles of ultra modern Detroit, in which the blast for a small cupola was supplied by a piston type blower. The three miniature blowing tubs were square instead of round, and the only difference between the rig and the old blast furnace outfit was that the cupola blower was driven by a small engine. What still is more remarkable is that at the time of writing the fan had been in continuous use for over 50 years.

"Originally a small fan was used on the cupola, but it was too noisy. Every person in the village knew when a heat was being run off in the foundry. Finally the old gentleman's father bought the shafting and piston rods for a piston type blower, but they lay unusued for several years for lack of the services of a man with sufficient knowledge to construct and erect the machine.

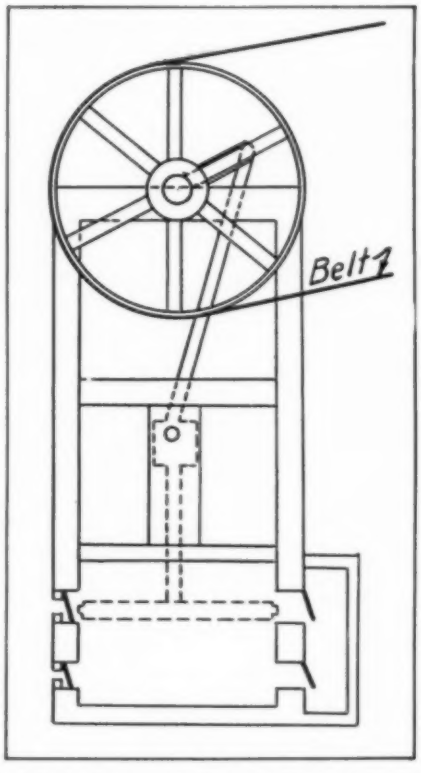
"Eventually an old millwright named Norton appeared on the scene and he set up the blower. The fact that it has been operating continuously since that time is eloquent tribute to the skill and knowledge of this honest old artizan. Of course continuously in this instance does not mean the same thing as it might in relation to a blast furnace, but nevertheless the performance constitutes quite a record.

The frame and connecting rods were made from maple and the air chambers were enclosed in white pine. Even the crankshafts ran in maple journals and the crossheads traveled in maple guides."

"A single pulley drove the crankshaft mounted on top of the frame. Three cranks 120 degrees apart on the shaft were connected to three wood pistons about 2 feet square enclosed in three separate chambers. Candle wick was used for packing at the point where the piston rod entered the chamber and leather strips around the edge of the piston rendered it air tight. Each of the air chambers was connected to a common auxiliary air chamber from which the air entered a pipe that led to the cupola. Top hung leather valves 3 x 6 inches admitted the air to each chamber while the piston was on the up stroke. The down stroke of the piston automatically closed these valves and opened others on the opposite side which allowed the air to enter the auxiliary chamber under pressure.

Furnace Operation

Yieldings of furnace for 12 months:	
600 tons pig iron @ $35	$21,000
80 tons hollow ware @ $100	8,000
40 tons stoves @ $80	3,200
	$32,200
Expenses of furnace:	
4 negro miners @ $100	$400
6 ditto woodchoppers @ $100	600
3 ox teams, feed and drivers @ $250	750
1 wood hauler and 2 oxen	150
5 colliers @ $100	500
1 principal manager	150
1 ox team and driver hauling coal	300
1 experienced founder	900
1 keeper	100
2 fillers @ $100	200
1 ore bank man	100
1 gutter boy	40
Making 80 tons hollow ware	266
Making 40 tons stoves, etc.	133
	$4,589
Profits	$27,611



Air Is Drawn in on the Up Stroke and Discharged Under Pressure on the Opposite Side on the Down Stroke

Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

H. F. SEIFERT, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., who recently was nominated for the presidency of the Pittsburgh Foundrymen's association has devoted his entire professional career to nonferrous metallurgical activities. He was graduated in 1906 from Columbia university with a degree of engineer of mines, and for 6 years thereafter was associated with the Nichols Copper Co., Laurel Hill, N. Y. He was in charge of the anode casting department of the Baltimore plant of the American Smelting & Refining Co. for 2 years, and since 1916 has been associated with the Westinghouse company. Mr. Seifert has devoted considerable attention to the reclamation of nonferrous scrap metals, and is assistant superintendent in charge of brass foundry and allied nonferrous operations of the Westinghouse company. He is a member of the American Foundrymen's association, and is a member of its committee on recommended practices for nonferrous metals.

D. J. Campbell recently was reelected president of the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich.

Carl F. Clarke, president and general manager, Monroe Steel Castings Co., Monroe, Mich., recently was elected president of the Detroit Balloon club.

R. F. Nash, Pettibone Mulliken Co., Chicago, was elected secretary of the large castings division, Steel Founders' Society of America, at the April meeting of the society.

Frederick A. Oefinger, Emaus, Pa., recently was elected president of the Plantsville Foundry Corp., Plantsville, Conn. He succeeds **Thomas W. Thomson.**

J. M. McKenzie, purchasing agent, West Steel Casting Co., Cleveland, has been elected vice president of the Purchasing Agents' association of Cleveland.

H. J. Philip has resigned as manager, South Market street plant, Brantford, Ont., of the Massey-Harris Co., Toronto, Ont. **C. F. Verity,** Verity Plow Works division of the company also has resigned.

Ralph H. West, West Steel Casting Co., Cleveland, was elected chairman of the program committee of the small castings division of the Steel Founders' Society of America at the April meeting.

Allen C. Anderson recently was appointed works manager, Iron Products Co., 417 West Spring street, Columbus, O. Mr. Anderson formerly was associated with Stevenson, Harrison & Jordan Engineering Co., Cleveland, and prior to that connection was assistant foundry superintendent, Marion Steam Shovel Co., Marion, O.

George F. Todd, for the past 2 years foreman of the brass foundry, T. McAvity & Sons Ltd., St. John, N. B., has severed his connection with

H. F. Seifert

that company. Prior to his association with the McAvity company, Mr. Todd was foreman of the gray iron foundry, Nova Scotia Car Works, Halifax, N. S., in 1911; molder for the Canadian Car & Foundry Co., Amherst, N. S., from 1912 to 1914; and foreman, Union Foundry & Machine Co. Ltd., West St. John, N. B., from 1915 to 1928. Mr. Todd's future plans have not been announced.

Frank B. Bell, president, Edgewater Steel Co., Oakmont, Pa., and **Harry M. Naugle,** Canton, O., have been elected directors of the United Engineering & Foundry Co., Pittsburgh, to fill vacancies on the board.

H. F. Holbrook, New York, recently was elected treasurer and general manager, W. A. Riddell Co., Bucyrus, O. Mr. Holbrook succeeds **George M. Schmidt. W. G. Beebe,** office manager of the Riddell company, was elected secretary to succeed Mr. Schmidt.

Cyril Ainsworth, for the past year in charge of the safety code work for the American Standards association, has been appointed assistant secretary of the association to succeed **F. J. Schlink.** Mr. Schlink resigned recently to become associated with Consumers' Research Inc. Mr. Ainsworth was educated at Swarthmore college and Carnegie Institute of Technology, Pittsburgh, and at various times has been connected with the Pennsylvania railroad, United Gas Improvement Co., Philadelphia, and the department of labor and industry of Pennsylvania.

George V. Lang, auditor and assistant treasurer of United Engineering & Foundry Co., Pittsburgh, has been elected to the additional office of secretary, succeeding the late **George H. Friesel,** who was also treasurer of the company.

D. H. Locke, president, Locke Pattern Works, Detroit, subsidiary of the American Radiator & Standard Sanitary Corp., has been appointed vice president and general manager of manufacturing, American Radiator Co., New York. Mr. Locke succeeds **A. E. Geddes,** resigned.

Clarence H. Howard has resigned as chairman of the board of General Steel Castings Corp., Eddystone, Pa., the position he has held since July 30, 1929, when that company acquired the Commonwealth Steel Co., Granite City, Ill., of which he had been president for 25 years. Mr. Howard worked four years as an apprentice at North Platte, Nebr., and located in St. Louis in 1882. He was graduated from Washington university and became foreman in the Missouri Pacific shops and later superintendent of Missouri Car & Foundry Co., Cambridge City, Ind. In 1889 he had charge of the railroad department of a St. Louis furniture company and in 1890 he became general manager of St. Charles Car Co., St. Charles, Mo. In 1891 he was made secretary of the Safety Car Heating & Lighting Co., New York, with offices in St. Louis, and had charge of the western district. He remained eight years and in 1899 became vice president of Shickle, Harrison & Howard Steel Co., Granite City, Ill., later known as Leighton & Howard Steel Co., which was absorbed in 1902 by American Steel Foundries. Mr. Howard obtained control of the Commonwealth Steel Co. in 1904 and was elected president. **C. H. Howard Jr.,** manager of the foreign department, General Steel Castings Corp., and **E. Howard Hooper,** assistant to Clarence H. Howard, also have resigned. It is understood they will be associated in a new business undertaking to be announced later.

Nominates Officers for Pittsburgh Group

H. F. Seifert, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was nominated at the last monthly meeting of the Pittsburgh Foundrymen's association for the presidency of that organization for the fiscal year 1931-1932. He had been vice president during the past year. T. A. Reynolds, McConway-Torley Co., was nominated for vice president and William J. Brant was renamed for the office of secretary-treasurer. Nominees for the executive committee include: W. E. Trautman, Continental Roll & Steel Foundry Co., Coraopolis, Pa.; F. C. T. Daniels, Mackintosh-Hemphill Co., Pittsburgh; H. P. Spilker, Sterrit-Thomas Foundry Co., Pittsburgh; S. B. Cuthbert, Carnegie Steel Co., Edgar Thomson Foundry, Braddock, Pa; and G. H. Zoerb, Sharpsburg Foundry Co., Sharpsburg, Pa. The formal election will be held at the next meeting May 18.

The April 20 dinner and meeting of the association was held at the Clifford B. Connelley Trade school and was attended by 65 members. H. F. Seifert presided, and speakers included Frank M. Leavitt, associate superintendent of schools of Pittsburgh, F. W. Boland, director of trade training, and L. H. Turner, principal of the Connelley school. An inspection of the school under the direction of Dean Connelley, for whom the school was named, followed. Facilities of the school include a fully equipped foundry, designed through the co-operation of a committee of the Pittsburgh Foundrymen's association composed of H. B. Spilker, A. J. Hartman and R. W. Jones, as well as a machine shop and pattern shop.

French Foundrymen Elect New Officers

Jules Cury, foundry proprietor, Deville, Ardennes, was elected president of the Association Technique de Fonderie de Paris, for the coming year at the recent annual general meeting of the association. M. Cury is regional inspector of technical education, ministry of public instruction, and a member of the board of directors, Ecole Superieure de Fonderie. The following vice presidents also were elected: E. Dady, engineer, and president of the Association Amicale et Mutuelle de Fonderie, Paris; the retiring president, A. Damour, steelmaker and foundry owner, Bayard, who remains president of the International Committee of Foundry Technical Associations until the end of this year; J. Derdinger, bronze founder Paris, honorary president of the Syndicate of Bronze Founders; Prof. F. Girardet, Nancy; H. Magdelenat, managing director, Societe des Usines de Rosieres, Bourges; L. Montupet, managing director, Societe des Fonderies Montupet, Paris; E. V. Ronceray, director, Ecole Superieure de Fonderie, and president of Etablissements Bonvillain et Ronceray, Choisy-le-Roi; and H. Sandre, managing director, Societe Metallurgique du Perigord, Paris.

The following men were re-elected vice presidents for their respective countries; J. Leonard, president of the Belgian foundry association, Belgium; J. M. Espana, honorary Spanish commercial attache at Paris, Spain; Carlo Vanzetti, managing director, Fonderies Milanaises d'Acier, Milan, Italy; and L. Brasseur, engineer, Luxemburg, Grand Duchy of Luxemburg. C. Koehler, general secretary, Syndicat General des Fondeurs de France, and managing director, Societe des Fonderies de St. Ouen, near Paris, and A. Lardin, manager, Societe Lardin & Cie., were re-elected honorary general secretary and the treasurer respectively. The nomination of the first vice president of the French association will take place at the next meeting of the council.

Brass Founders of New England Meet

The regular monthly meeting of the Associated Brass Founders of New England was held April 22 at the Engineers club, Boston, with G. W. Thornburg, president of the association, presiding. James V. Martin, Monarch Engineering & Mfg. Co., Baltimore, gave an interesting talk on the cost of operation of coal, coke, gas and oil-fired furnaces. He also spoke on methods of operation to secure maximum efficiency. Mr. Martin was accompanied by Mr. Harvey of the same company. L. P. Robinson, Werner G. Smith Co., Cleveland, former secretary of the association, also was present and gave a fine talk on business conditions.

Quad-City Group Meets

Seventy-three members attended the regular monthly meeting of the Quad-City Foundrymen's association held in the Davenport chamber of commerce, Davenport, Iowa, April 20. R. L. Eichman, president of the association, presided at the meeting and appointed a picnic committee with John Ploehn, French & Hecht Inc., Davenport, as chairman.

C. O. Thieme, research metallurgist, H. Kramer Co., Chicago, was the speaker of the evening. He gave an interesting talk on brass ingot in the nonferrous foundry. The speaker explained in detail the equipment and process used in producing brass ingot from scrap and the advantages to be derived from use of that product. Mr. Thieme's talk was followed by an interesting discussion.

OBITUARY

Wilbur S. McIntyre, 64, founder and president, Welland Iron & Brass Co., Welland, Ont., died recently.

Charles M. Holbrook, 73, for many years purchasing agent of National Transit Pump & Machine Co., Oil City, Pa., died April 28.

Edgar V. Green, 67, production manager, Columbus Malleable Iron Co., Columbus, O., died April 21. He had been with the company more than 17 years.

Cletus J. Xanders, foundry foreman, International Harvester Co., Springfield, O., died April 19. Mr. Xanders was born 55 years ago in Clark county, O., and had been in the employ of the International company for approximately 20 years, during which time he occupied several positions until his promotion to foundry foreman.

G. D. Wolfley, Eastern representative, Arcade Mfg. Co., Freeport, Ill., died at Buffalo, recently. Mr. Wolfley was 69 years old and had been connected with the Arcade Mfg. Co. since 1905. He spent about three years as foundry foreman and since that time had been a sales representative for the molding machine department.

Joseph Bodine Terbell, 68, chairman of the board, American Brake Shoe & Foundry Co., New York, died at his home on April 15. Mr. Terbell was born at Corning, N. Y., Feb. 12, 1863 and was graduated from Hamilton College in 1884. He immediately became affiliated with the Fall Brook railroad, now a part of the New York Central system. He was an officer of this road for 13 years, until 1897, when he became president of the Corning Brake Shoe Co., a position he held at the time that company was merged with the American Brake Shoe & Foundry Co., in 1902. He then was made vice president of the American Brake Shoe & Foundry Co. In 1919 he became president, retiring 10 years later to take the chairmanship of the board.

Clifford E. Pierce, 50, president and one of the founders of Betz-Pierce Iron & Steel Co., Cleveland, iron and steel jobber, died April 20 at Lakeside hospital, Cleveland. He formed the company with A. B. Betz in 1911, both having been previously connected with Basset-Presley Co., Cleveland. Mr. Pierce, formerly vice president and treasurer, became president in 1923, succeeding Mr. Betz, whose interest he purchased. On June 5, 1925, he also was elected president of Massillon Steel Castings Co., Massillon, O., in succession to Emmett H. Birney, resigned. He had been on the directorate of the Massillon company for the preceding three years and had served two years as vice president.

What the Foundries Are Doing

Reflecting the Activities of Gray Iron, Malleable, Steel and Brass Shops

Henry Flockhart has acquired control of the Metals Casting Inc., 44 Clover street, Newark, N. J.

The foundry of the Coos Bay Iron Works, Marshfield, Oreg., recently was damaged by fire to the extent of approximately $5000.

Fuchs & Lang Mfg. Co., Rutherford, N. J., has discontinued its foundry department.

Jakes Foundry Co., 2800 Charlotte avenue, Nashville, Tenn., has reduced its capital stock from $100,000 to $80,000.

National Rubber Machinery Co., Wellington street, Clifton, N. J., has been operating on a full time schedule since the middle of January.

Kearny Brass Foundry Inc., 296 Maple street, Kearny, N. J., reports a fair year for 1930 and a good business outlook at present.

Oakley Valve & Foundry Co., 60 Ferguson street, Newark, N. J., has moved to its new plant at 17-21 Newark way, Maplewood, N. J.

Ohio Steel Foundry Co., Springfield, O., is building a 3-story addition to its pattern storage building. The new addition will be 60 x 150 feet.

Erb-Joyce Foundry Co., Vassar, Mich., is installing an electric furnace and making other improvements to the plant.

Canada Culvert Co. Ltd., London, Ont., has been incorporated by Ashton R. Douglas to carry on the business of ironmaster and founder.

American Furnace & Foundry Co., Milan, Mich., has resumed operations after being closed for approximately 3 weeks. Operations are on a 4 day per week schedule with full force.

Buildings which formerly housed the Sharon, Pa., works of the American Steel Foundries are being razed. The plant has been idle for more than 10 years.

Krone-Sebek Die Casting Mfg. Co., 2935 West Forty-seventh street, Chicago, has taken over Autodraulic Corp., a company marketing a hydraulic jack for automobiles.

Plantsville Foundry Corp., Plantsville, Conn., will manufacture gray iron castings. Frederick A. Oefinger is president, William C. Kline, vice president and B. F. Harpel, secretary.

Layne & Bowler Inc., Memphis, Tenn., has let the contract to Meers & Wallenta, 63 South Third street, Memphis, for a 2-story, fireproor, pattern storage building at 2005 Chelsea avenue.

Union Foundry Works, Chicago, has moved its offices from 38 South Dearborn street to the foundry plant at 7610 Greenwood avenue, Grand Crossing station, Chicago.

Inlay City Mfg. Co., Imlay City, Mich., has started production in a foundry on South Almont avenue. Bronze and aluminum articles will be manufactured.

Terre Haute Malleable & Mfg. Co., Terre Haute, Ind., is having plans made for a foundry addition. Cost of the new structure is estimated at $40,000.

Liberty Foundry Co., 7600 Vulcan street, St. Louis, has purchased the fixtures and machinery of the Crescent Foundry Co., St. Louis. The building was not included in the sale.

Houston Car Wheel & Machine Co., Houston, Tex., has changed its name to Houston Foundry & Machine Co. A. J. Binz is president, and W. A. Raymond vice president and general manager.

Schuessler Foundry Co., Federal, Ill., which recently was severely damaged by fire, has resumed operations at practically normal capacity. A. J. Schuessler, president of the company, reports the business outlook promising.

Hartley Machine Co., Owosso, Mich., has purchased one of the plant units of the Owosso Foundry Co., and will build an addition, 30 x 120 feet. The company manufactures machines for polishing stainless steel.

Advance Motor Corp., Patterson, N. J., has been incorporated with $250,000 capital by Andrew C. Frommelt, 115 Market street, to operate a foundry. Adrian Gerritsen, 360 North Tenth street, is interested.

Neenah Foundry Co., Neenah, Wis., has been incorporated with $100,000 capital by E. J. Aylward, Eunice B. Aylward and James P. Keating. The company will carry on a general foundry business.

George W. Reed & Co. Ltd., 4107 Richelieu street, Montreal, Que., is having plans prepared by T. Pringle & Sons Ltd., 410 St. Nicholas street, Montreal, for the erection of a foundry estimated to cost $100,000.

Bids were taken May 15 by the department of purchase, New York, for 500 gray iron bases 12 inches in diameter weighing 19,000 pounds; 1000, one-inch malleable iron eye ring caps; and 1500 malleable iron lamp hooks.

Harding Foundry & Furnace Supply Co., Columbus, O., has been incorporated with $25,000 capital by Beman Thomas & Co., 635 Huntington Bank building, to operate a foundry. Earle O. Buxton, 2638 Glenmawr avenue, Columbus, is interested.

Cocker Machine & Foundry Co., 207 South Chestnut street, Gastonia, N. C., is reported to have been reorganized. Officers of the company are: George B. Cocker, president; A. G. Myers, vice president and J. B. Reeves, secretary and treasurer.

Alton Foundry Co., Alton, Ill., reports that business conditions have improved materially. The company is operating 6 days per week and has sufficient orders to maintain full operation for the next 3 months. T. Stoltze is vice president.

Allis-Chalmers Mfg. Co., Milwaukee, has acquired the manufacturing properties and business of the Advance-Rumely Corp., LaPorte, Ind. The Allis-Chalmers company also will take over the Advance-Rumely branch houses throughout the United States.

Pulaski Foundry & Mfg. Co., Pulaski, Va., has received the contract for nine bell buoys for government light houses. Sweet & Doyle Foundry & Machine Co., Troy, Green Island, N. Y., has received the contract for 16 cast iron sinkers on the same job.

Zane Casting Co., Zanesville, O., is erecting three buildings which will house a foundry, machine shop and store room. The new additions will facilitate the production of bronze, brass, other nonferrous alloys and semi-steel castings weighing from 1 pound to 10 tons.

Sidney Brass Works, 313 Shelby street, Sidney, O., formerly operated by George Trautman, recently was acquired by R. E. McCain. The name of the company has been changed to the Sidney Foundry Co. The firm will continue to produce brass, bronze and aluminum castings.

The name of the Consolidated Foundries Co., San Francisco, has been changed to the General Metals Corp. Offices of the company have been moved from Oakland to 485 California street, San Francisco. The General Metals Corp. is controlled by the Transamerica Corp.

A foundry will begin operations in Hartford City, Ind., for the production of gray iron castings. The new business will be housed in the plant of the former Johnston Glass Co., West Washington street, Hartford City. Albert Pitts, Montpelier, Ind., is one of the owners and operators.

American Hardware Corp., New Britain, Conn., has organized the American Hardware Corp. of Canada Ltd., and has taken over the business of the Springer Lock Mfg. Co. Ltd., Belleville, Ont. Plans for extension are undetermined at present. W. C. Springer, former proprietor of the Springer company, will remain with the new company.

Intercontinental Pipe & Mining Co., in care of H. Kennedy Co., 122 East Forty-second street, New York, will proceed with plans for the alteration of plant units acquired at New Castle, Del. Plans also include equipment. The plant will manufacture steel and iron pipe. Cost of the construction is estimated at $1,000,000.

Tallman Brass & Metal Ltd., Hamilton, Ont., has been completely reorganized under the receivership of G. T. Clarkson. The Doehler die casting process is used in that department and under the new arrangement its capacity has been increased. Other products are metal stampings, spinnings, brass and bronze castings and solid and cored bars.

Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, was low bidder on a New York board of water supply contract, which calls for equipment involving approximately 150 tons of manganese bronze castings and 133,000 pounds of steel castings. This equipment is for drainage shaft 9A, city tunnel 2, and includes two 66-inch bronze section valves, two lines of 66-inch bronze waterway castings, two bronze doors, two 16-inch bronze gate valves, two 16-inch bronze needle valves, one 18-inch and one 6-inch bronze check valve, bronze piping and miscellaneous bronze and steel castings.